REQUEST FOR PROPOSAL (RFP)
ELECTRIC TRANSIT BUSES
RFP # 23-T010

The Fort Worth Transportation Authority operating as ("Trinity Metro") outlines the following schedule:

RFP Release Date:	**April 26,2023**
Proposal Submission Deadline:	**May 24, 2023**
REVIEW THE FULL SCHEDULE OF EVENTS IN SECTION 2	

PLEASE NOTE THE CHANGE OF ADDRESS FOR TRINITY METRO INDICATED BELOW

Preamble:
The Fort Worth Transportation Authority operating as Trinity Metro is a regional transportation authority of the State of Texas, created pursuant to Chapter 452, Transportation Code of Texas and confirmed by a public referendum on November 8, 1983. The Trinity Metro provides public transportation services within the city limits of Fort Worth, Blue Mound, and River Oaks. Such services include fixed bus routes, mobility impaired transportation service (ACCESS), carpool/vanpool services, ZIPZONE and commuter rail (TEXRail and Trinity Railway Express, (TRE)). A one-half of one percent ($.0050) sales tax is dedicated to supporting the Trinity Metro's public transportation program. Trinity Metro is also the recipient of Federal Transit Administration (FTA) capital grants and Texas Commission on Environmental Quality grants.

Trinity Metro is governed by an eleven-member Board of appointed officials. Eight Board members are appointed by the Fort Worth City Council and three Board members are appointed by the County Commissioners Court, in accordance with Subchapter N., Sec. 452.562 (c) – (f) of the Transportation Code. The Board sets policy through standing and ad hoc committees, and establishes broad business goals and policies for management. The President & Chief Executive Officer reports to the Board, and is responsible for implementation of Board policies and day-to-day operations of the Trinity Metro.

This Request for Proposal implies no obligation on the part of the Trinity Metro to award a contract or to pay any costs incurred in the preparation or submittal of any Proposal. Trinity Metro reserves the right to accept the Proposal that it believes most nearly meets the requirements, based on "best value" and not necessarily the lowest price offered.

Trinity Metro
801 Grove Street
Fort Worth, Texas 76102

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Section 1 Minimum Requirements			
NAME	**FORM DESCRIPTION**	**FORM NUMBER**	**SUBMIT WITH OFFER?**
Cover Page	Solicitation Number, Title, Due Date	None	**YES**
Section 2	Schedule of Events	None	
Section 3	Instruction to Proposers	None	
Section 3	3.16.1 1.Pre-Award Buy America Certification or Pre-Award Buy America Certificate of Non-Compliance	Proposer	**YES**
Section 3	3.16.1 2.Certification of Compliance with or Inapplicability of Federal Motor Vehicle Safety Standards (FMVSS)	Proposer	**YES**
Section 4	Evaluation and Response	None	
Section 5	Scope of Work	None	
Section 6	Special Provisions	None	
Section 7	Federal Contract and Other Requirements	None	
Section 8	Detailed Submittal Requirements	Proposer	
Section 9	Safety, Security and Emergency Requirements	None	
Section 10	Compliance, Certifications, Attachments and Amendments	F1	**YES**
	DBE Compliant Statement	F2	**YES**
	Certification of Contractor Regarding Debarment, Suspension, and Other Responsibility Matters	F3	**YES**
	Conflict of Interest Acknowledgement and Certification	F4	**YES**
	Certification of Compliance with Restriction on Lobbying	F5	**YES**
	Buy America Compliance	F6	**YES**
	Business Questionnaire & List of References	F7	**YES**
	List of References for Similar Projects	F8	**YES**
	Affidavit of Non Collusion	F9	**YES**
	Prohibition of Contracts with Companies Boycotting Israel	F10	**YES**
	Trinity Metro Safety, Security and Emergency Requirements	F11	**YES**
	Base Price Proposal	F12	**YES**

Section 2 Schedule of Events

EVENTS	DATE	TIME
RFP Release Date	April 26, 2023	5:30 PM
Deadline for Submission of Written Questions (1)	May 17, 2023	5:00 PM
Proposal Submission Deadline	May 24, 2023	2:00 PM
Review and Selection of Top-Ranked Proposers	June 9, 2023	
Vendor Demonstrations from Top-Ranked Vendors (2)	June 12, 2023	
Contract Negotiations	June 21, 2023	
Trinity Metro Board Meeting Recommended Approval for Award (3)	August 21, 2023	
Contract Executed (4)	August 2023	

(1) Questions will be received in writing by e-mail. No questions will be answered verbally.
(2) The Trinity Metro reserves the right to not conduct oral demonstrations and/or interviews and select a Contractor based on the written proposals only.
(3) The Evaluation Committee's recommendation of contract award is scheduled for Board presentation by the date above; however, Trinity Metro reserves the right to change the award date.
(4) Trinity Metro reserves the right to change the contract execution date.

Section 3 Instructions to Proposers

3.1 Downloading RFP and Submission of Proposals
RFP documents can be downloaded from Trinity Metro's website and the Proposals can be submitted in hard copy to the address listed below.

https://www.procuretm.org/procurements

Sealed proposals should be delivered by the date and time outlined in the Schedule of Events in Section 2. Proposers shall submit one original, one copy, and all of the required Proposal documents. All Proposal documents shall be in a sealed package, addressed as shown below, bearing the Proposer's name and address and clearly marked as follows:

Trinity Metro
Attn: PROCUREMENT
801 Grove Street
Fort Worth, TX 76102
RFP 23-T007 High Intensity Electric Transit Buses

You can also submit your proposal electronically using the Trinity Metro electronic bidding portal Bonfire. Here is the link.

The Bonfire Portal is: **https://ridetm.bonfirehub.com/portal/?tab=openOpportunities**

All proposals, electronic or hard copy, must be submitted by the date stated in the schedule of events. It is the sole responsibility of the Respondent to ensure timely delivery of the Proposal Response. Trinity Metro will not be responsible for failure of service on the part of the U.S. Post Office, courier services, electronic difficulties, or any other form of delivery service chosen by Respondent.

For uniformity, all respondents are required to submit information in the order and format requested in this RFP. Failure to do so may cause the proposal to be deemed nonresponsive to the RFP. Information requested in the RFP, which are deemed privileged information and confidential by the Company, may be submitted in a separate envelope marked "Privileged and Confidential Information." Trinity Metro will use its best efforts to protect such information from disclosure to the extent allowable by law. There will be no release of information until the selection process is complete and a contract has been executed.

Proposals arriving late due to a delay in the delivery process will not be accepted.

3.2 Basis for Contract Negotiation
This RFP and the resulting proposals shall be used as the basis for final contract negotiation. The RFP does not commit Trinity Metro to procure or award a contract for the scope of work described herein.

Exceptions to Any Portion of the Solicitation Requirements

Exceptions to RFP terms and conditions - Proposers are cautioned to limit all exceptions, conditions, and limitations to the proposal documents as they may be determined to be so fundamental as to cause rejection of the proposal for not responding to the requirements of the RFP.

All exceptions taken to the terms and conditions of the solicitation, to any of its formal attachments or to other parts of the solicitation shall be clearly identified and submitted with Proposer's response to RFP. Each exception shall be specifically related to each paragraph and/or specific part of the solicitation to which the exception is taken. Proposer shall provide rationale in support of the exception and fully explain its impact, if any, on the performance.

All exceptions will be considered during the evaluation process. Exceptions made after Contract award may result in proposal being rejected.

3.3 Rejection of Proposals

Trinity Metro reserves the right to reject any or all proposals and to select the proposal and the Company that, in Trinity Metro's sole discretion, is in the best interests of Trinity Metro.

Trinity Metro reserves the right to:

- Amend, modify, or withdraw this RFP;
- Revise any requirements under this RFP;
- Require supplemental statements of information from any responding party;
- Extend the deadline for submission of responses hereto;
- Negotiate or hold discussions with any proposer to correct insufficient responses that do not completely conform to the instructions contained herein;
- Waive any nonconformity with this RFP;
- Cancel, in whole or in part, this RFP if Trinity Metro deems it is in its best interest to do so;
- Request additional information or clarification of information provided in the response without changing the terms of the RFP; and
- Waive any portion of the selection process in order to accelerate the selection and negotiation with the top-ranked management company.

Trinity Metro may exercise the foregoing rights at any time without notice and without liability to any proposer, or any other party, for expenses incurred in the preparation of responses hereto or otherwise. Responses hereto will be prepared at the sole cost and expense of the proposer. Issuance of this RFP does not bind Trinity Metro to award a contract.

1. Nothing stated at any time, by any representative of Trinity Metro, will effect a change in, or constitute an addition to, this RFP unless confirmed in writing by Trinity Metro.

2. Respondents hereto must agree to keep confidential their response and any information received from Trinity Metro.

3. All information submitted in response to the RFP shall become the property of Trinity Metro, and as such, may be subject to public review as public records.

4. Respondents acknowledge and agree that Trinity Metro will not be liable for any costs,

expenses, losses, damages (including damages for loss of anticipated profit), or liabilities incurred by the respondent or any member thereof as a result of, or arising out of, submitting a proposal, negotiating changes to such proposal, or due to Trinity Metro's acceptance or non-acceptance of the proposal.

5. Trinity Metro shall provide the release of all public information concerning the project, including selection announcements and contract awards. Those desiring to release information to the public must receive prior written approval from an authorized representative of Trinity Metro.

6. Neither Trinity Metro nor any of its officers, agents, consultants, or employees shall be responsible for the accuracy of any information provided as part of this RFP (including appendices). All respondents are encouraged to independently verify the accuracy of any information provided. The use of this information in the preparation of a response to the RFP is at the sole risk of the respondent.

7. The respondent shall not collude in any manner or engage in any practices with any other respondent(s), which may restrict or eliminate competition or otherwise restrain trade. Violation of this instruction will cause Trinity Metro to reject the respondent's submittal. This prohibition is not intended to preclude joint ventures or subcontracts.

8. All responses submitted must be the original work product of the respondent. The copying, paraphrasing, or other use of substantial portions of the work product of another respondent is not permitted. Failure to adhere to this instruction will cause Trinity Metro to reject the response. **The successful respondent will be required to enter into contract by signature on separate contract documents, which will be prepared by Trinity Metro from information in the RFP and the successful respondent's proposal.**

9. Any respondent may protest such recommended award in accordance with FTA Circular 4220.1F.

3.4 Response to Communications and Request for Clarification

It is the responsibility of the proposer to examine the entire RFP package and seek clarification of any scope of work or specification item or requirement that may not be clear and to check all responses for accuracy before submitting a response. All requests for clarifications or changes shall be submitted in writing in time to be received in accordance with the Schedule of Events outlined in Section 2.

Trinity Metro will not respond to oral requests. Only written requests for questions and/or clarifications, will be acceptable (email and/or email attachments will be accepted). All questions and/or clarifications requests shall be sent to the attention as identified below. Only written responses from Trinity Metro, provided as addenda shall be official and all other forms of communication with any officer, employee or agent of Trinity Metro shall not be binding. All questions and/or clarifications and/or request for a change to any of the specifications shall be fully supported with technical data, test results, or other pertinent information evidencing that the exception will result in a condition equal to or better than that required by the RFP, without substantial increase in cost or time requirements. Any responses to such written requests shall be provided by Trinity Metro in the form of an addendum.

All questions or request for clarifications regarding the services required shall be submitted in writing and/or email (no phone inquiries will be accepted) and addressed to:

Procurement Contract Administration
Trinity Metro
801 Grove Street
Fort Worth, Texas 76102
E-mail: contractmgmt@ridetm.org

Proposers shall not contact members of the Evaluation Committee or Board of Directors. Any proposers violating this provision may be disqualified from consideration in this RFP.

3.5 Addenda and Attachments to RFP

This Request for Proposal (RFP) has been posted on Trinity Metro's website and Trinity Metro's electronic bidding portal Bonfire for your convenience. Any attachments, addendums, clarifications or further instructions to proposers, whether as a result of questions raised by proposers or initiated by Trinity Metro will also be posted when issued. It is the Proposer's responsibility to ensure that the entire RFP package, in its latest version, is reviewed prior to submittal of a proposal.

3.6 Proprietary Information

If a proposal includes proprietary data or information that the proposer does not want disclosed to the public, such data or information shall be specifically identified as such and marked "Privileged and Confidential Information" on every page on which it is found. Data or information so identified will be used by Trinity Metro solely for the purpose of evaluating proposals and conducting contract negotiations. Disclosure of any proprietary information by Trinity Metro shall be in strict accordance with the laws and regulations regarding disclosure in the State of Texas. Trinity Metro will use its best efforts to protect such information from disclosure to the extent allowable by law. There will be no release of information until the selection process is complete and a contract has been executed.

3.7 Contract Award

Trinity Metro reserves the right, as the interests of the Authority may require, to postpone, accept or reject any and/or all proposals and to waive any informalities in the proposals received, and to award the contract(s) to the best responsive and responsible proposer. Trinity Metro reserves the right to make multiple awards.

In awarding a contract, Trinity Metro reserves the right to consider all elements entering into the determination of the responsibility of the proposer. Any proposal which is incomplete, conditional, obscure, or which contains additions not called for or irregularities of any kind, may be cause for rejection of the proposal.

The contract for the services may be awarded within 90 calendar days from the date upon which proposals were received to the proposer Trinity Metro deems most responsive and responsible.

In the event a single proposal is received, Trinity Metro will conduct a price and/or cost analysis of the proposal. A price analysis is the process of examining and evaluating a price submitted without examining in detail the separate cost elements and the profit included in the cost proposal. It should be recognized that a price analysis through comparison to other similar procurements shall be based upon an established or competitive price of the elements used in the comparison. The

comparison shall be made to a purchase of similar quantity and involving similar specifications. Where a difference exists, a detailed analysis shall be made of this difference and costs associated thereto. Trinity Metro has the right to enter into a negotiated procurement should only a single proposal be received.

Where it is impossible to obtain a valid price analysis, it may be necessary for Trinity Metro to conduct a cost analysis of the proposal price.

3.8 Disadvantaged Business Enterprise Requirements
Pursuant to Title 49, Code of Federal Regulations, Part 26.49, a Proposer, as a condition of being authorized to respond to this solicitation, must certify by completing the form DBE Approval Certification that it has on file with the Federal Transportation Administration (FTA) an approved or not disapproved annual Disadvantaged Business Enterprise (DBE) subcontracting participation goal.

3.9 Non-Collusion Affidavit
Proposer shall submit, with its proposal, an affidavit stating that neither proposer nor its agents, nor any other party on its behalf, has paid or agreed to pay, directly or indirectly, any person, firm, or corporation, any money or valuable consideration for assistance in procuring or attempting to procure the contract that may result from this RFP, and further agrees that no such money or consideration will be hereafter paid. This affidavit shall be on the form provided by Trinity Metro, which is made a part of this RFP.

3.10 Disclosure of Interested Parties
Section 2252.908 of the Texas Government Code states that Texas state agencies and other Texas governmental entities, such as the Trinity Metro, may not enter into certain contracts with a business entity unless the entity submits a "disclosure of interested parties" (Form 1295). The successful Proposer must submit a completed, executed, and notarized Form 1295, with the certification number of filing with the Texas Ethics Commission, when a contract is delivered to Trinity Metro for execution. Please refer to the information at the Texas Ethics Commission's website for instructions on registering and completing Form 1295. Trinity Metro must notify the Texas Ethics Commission of the receipt of the filed Form 1295 with the certification of filing not later than the 30th day after the date the contract binds all parties to the contract. The commission will post the completed Form 1295 to its website within seven business days after receiving notice from Trinity Metro. Trinity Metro will not execute the contract, and no agreement will be formed if Trinity Metro has not received the certification of filing.

3.11 Prohibition of Contracts with Companies Boycotting Israel
The Texas Government Code, Chapter 2270, creates a Prohibition of Contracts with Companies Boycotting Israel.

Effective September 1, 2017, a state agency and a political subdivision (which includes a transportation authority) may not enter a contract with a company for goods or services unless the contract contains a written verification from the company that; (i) it does not Boycott Israel; and (ii) will not Boycott Israel during the term of the contract.
"Boycott Israel" is defined to mean refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

"Company" is defined to mean a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exists to make a profit. See Form F-12 attached.

3.12 Force Majeure

Definition: Acts of God; earthquake, unusually severe weather, flood and any other natural disaster; civil disturbance, strikes and labor disputes; fires and explosions; war and other hostilities; embargo; or failure of third parties, including Suppliers or Subcontractors, to perform their obligations to the Contractor due to a force majeure event described above.

Economic hardship, changes in market conditions, or insufficiency of funds do not constitute an Event of Force Majeure, and an Event of Force Majeure does not excuse an obligation to make a payment required under this Contract.

If Contractor cannot perform some of its obligations due to an Event of Force Majeure, it must nevertheless continuously and diligently carry out and complete all of its obligations not prevented by the Event of Force Majeure.

Notice of Delay. If Contractor is delayed in the performance of the Services due to an Event of Force Majeure or otherwise, Contractor must in a prompt manner upon receiving knowledge of such delay give written notice thereof to Trinity Metro and furnish Trinity Metro information concerning the cause of the delay and its approximate anticipated length and demonstrating, if applicable, that the delay is due to an Event of Force Majeure.

Sole Relief. If an Event of Force Majeure occurs, provided Contractor has complied with all applicable notice requirements regarding a request for relief under this section, Contractor is excused from performance of its obligations under this Contract, but only for the time and to the extent that such performance is actually prevented by the Event of Force Majeure. When Contractor is able to resume performance of its obligations, it shall immediately give Trinity Metro written notice to that effect and promptly resume performance under this Contract. The relief offered by this Force Majeure provision is the exclusive remedy available to Contractor with respect to an Event of Force Majeure, and no claim for damages shall be made by either party for delays resulting from an Event of Force Majeure.

Continuing Delays. Trinity Metro may terminate this Contract if:
Contractor's failure to perform under this Contract due to an Event of Force Majeure impairs the material benefits of this Contract to Trinity Metro; and

Contractor does not resume performance in accordance with this Contract within ten (10) business days following Trinity Metro's giving notice to Contractor of Trinity Metro's intent to terminate this Contract.

3.13 Buy America Certification

This Contract is subject to the "Buy America" requirements of 49 United States Code (USC) §5323(j) and 49 Code of Federal Regulations (CFR) Part 661, as may be amended from time to time, and applicable federal regulations. Prospective proposers' attention is directed to 49 CFR

§661.11, "Rolling Stock Procurements." Prospective Proposers have the responsibility to comply with the cited and any governing statutes and regulations, including official interpretations.

A Proposer shall submit in the proposal the appropriate Buy America certification, included in this document, with all offers on FTA-funded contracts. Proposals that are not accompanied by a properly completed Buy America certification are subject to the provisions of 49 CFR 661.13 and will be rejected as nonresponsive.

The two signature blocks on the Buy America certificate are mutually exclusive. Proposers shall sign only one signature block on the certificate. Signing both signature blocks will make the Proposal nonresponsive. A false certification is a criminal act in violation of 18 USC §1001.

A Proposer who has submitted an incomplete Buy America certificate or incorrect certificate of noncompliance through inadvertent or clerical error (but not including failure to sign the certificate, submission of certificates of both compliance and noncompliance, or failure to submit any certification), may submit to the FTA chief counsel within ten (10) days of Proposal opening a written explanation of the circumstances surrounding the submission of the incomplete or incorrect certification in accordance with 28 USC §1746, sworn under penalty of perjury, stating that the submission resulted from inadvertent or clerical error. The Proposer will also submit evidence of intent, such as information about the origin of the product, invoices, or other working documents. The Proposer will simultaneously send a copy of this information to the Agency.

The FTA Chief Counsel may request additional information from the proposer, if necessary.
The Agency may not make Contract award until the FTA Chief Counsel issues his or her determination, except as provided in 49 CFR Part 661.15(m).

Certification based on ignorance of proper application of the Buy America requirements is not an inadvertent or clerical error.

A waiver from the Buy America provisions will be sought by the Agency from the FTA, for the proposed awardee, if the grounds for a waiver exist. All Proposers seeking a waiver must submit to the Agency a timely request in writing, which shall include the facts and justification to support the granting of the waiver. Such waiver from the Buy America provisions may be granted if the FTA determines the following:

1. Their application would be inconsistent with the public interest;
2. Materials are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of domestic material will increase the cost of the overall Contract by more than 25 percent.

Any party may petition the FTA to investigate a successful Proposer's compliance with the Buy America certification. The procedures are set out in 49 CFR Part 661.15. If the FTA determines the evidence indicates noncompliance, the FTA will require the Agency to initiate an investigation.

The successful proposer has the burden of proof to establish compliance with its certification. If the successful proposer fails to so demonstrate compliance, then the successful Proposer will be required to substitute sufficient domestic materials without revision of the original Contract terms. Failure to do so will be a breach of the Contract and may lead to the initiation of debarment proceedings under 49 CFR Part 29.

Buy America Certification requires the completion of two audits; Pre-Award and Post-Delivery Audit.

3.13.1 Pre-Award Audit

There are **two certificates** that **must be included in the proposal** to meet the pre-award audit:

1. Pre-Award Buy America Certification or Pre-Award Buy America Certificate of Non-Compliance - The Proposal must include the Manufacturer's Certification of Compliance or Non-Compliance with Buy America Rolling Stock Requirements per 49 CFR § 661.12. The Manufacturer certification must be completed by an independent auditor. **The auditor report must at a minimum include** component and subcomponent parts of the rolling stock to be purchased identified by manufacturer of the parts, their country of origin and costs, the location of the final assembly point for the rolling stock, and a description of the activities that will take place at the final assembly point and the cost of final assembly. To assist Trinity Metro, determine compliance with Buy America, the independent report may also contain past performance on previous vehicle orders, qualifications of key personnel, facility layouts/drawings, production line layout/flowchart, plant output capacity (i.e., max. production rate per week), staffing counts by craft, readiness of fixtures for car body construction, quality assurance and control plan and any other items necessary to execute the work.

2. Certification of Compliance with or Inapplicability of Federal Motor Vehicle Safety Standards (FMVSS)

3.13.2 Post-Delivery Audit

Selected proposer (Contractor) should be aware that Trinity Metro is required to conduct a post-delivery audit to verify compliance with the Buy America Requirements and therefore, Contractor certifies, by submitting its proposal in response to this RFP 23-T010 that Contractor shall cooperate with Trinity Metro, its independent auditor(s), agents, and/or consultants to facilitate the post-delivery audit.

3.14 Build America/Buy America

As appropriate and to the extent consistent with law, the Service Provider should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). Consistent with §200.322, the following items shall be defined as: "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

Section 4 Evaluation Criteria

Evaluation and Selection Criteria

Proposals will be evaluated by a selection committee of individuals from Trinity Metro. Trinity Metro intends to evaluate the proposals generally in accordance with the criteria listed below. Trinity Metro may invite proposers to make a presentation and be interviewed by the committee as part of the selection process.

At Trinity Metro's own discretion, Trinity Metro may negotiate with proposers whose proposal is ranked the most qualified firm based on the evaluation factors set forth below and/or within the competitive range. Proposals shall be clear, concise and include sufficient detail for effective evaluation.

Selection Criteria (out of a total of 100 points)

Technical Specification Compliance	30 Points
Experience and Competency of Contractor	20 Points
Contractor Resource and Supply Support	10 Points
Financial Solvency	5 Points
Delivery Schedule	15 Points
Fee or Cost Proposal: The proposal with the lowest overall fee will receive the maximum points by weight.	20 Points

Section 5 Scope of Work

TECHNICAL SPECIFICATIONS

GENERAL

TS 1 Scope

Technical specifications define requirements for heavy-duty commuter coaches. By selecting specifically identified alternative configurations, may be used for both suburban express service and general service on interstate highways. Buses shall have a minimum expected life of twelve (12) years or 500,000 miles, whichever comes first, and are intended for the widest possible spectrum of passengers, including children, adults, the elderly and people with disabilities. **This specification is for Six (6) 35' "Battery Electric Bus" transit buses with options for up to 50 additional units that can be in 30', 35' or 40' configurations over the next five years. Also a complete and turn Key charging system including infrastructure for charging these buses and any future bus purchases.**

TS 2 Definitions

Alternative: An alternative specification condition to the default bus configuration. The Agency may define alternatives to the default configuration to satisfy local operating requirements. Alternatives for the default configuration will be clearly identified.

Ambient Temperature: The temperature of the surrounding air. For testing purposes, ambient temperature must be between 16°C (50°F) and 38°C (100°F).

Analog Signals: A continuously variable signal that is solely dependent upon magnitude to express information content.

> **NOTE:** Analog signals are used to represent the state of variable devices such as rheostats, potentiometers, temperature probes, etc.

Audible Discrete Frequency: An audible discrete frequency is determined to exist if the sound power level in any 1/3-octave band exceeds the average of the sound power levels of the two adjacent 1/3-octave bands by 4 decibels (dB) or more.

Battery Compartment: Low-voltage energy storage, i.e. 12/24 VDC batteries.

Battery Management System (BMS): Monitors energy, as well as temperature, cell or module voltages, and total pack voltage. The BMS adjusts the control strategy algorithms to maintain the batteries at uniform state of charge and optimal temperatures.

Braking Resistor: Device that converts electrical energy into heat, typically used as a retarder to supplement or replace the regenerative braking.

Burst Pressure: The highest pressure reached in a container during a burst test.

Capacity (fuel container): The water volume of a container in gallons (liters).

Cells: Individual components (i.e., battery or capacitor cells).

Code: A legal requirement.

Combination Gas Relief Device: A relief device that is activated by a combination of high pressures or high temperatures, acting either independently or together.

Container Appurtenances: Devices connected to container openings for safety, control or operating purposes.

Container Valve: A valve connected directly to a container outlet.

Curb Weight: Weight of vehicle, including maximum fuel, oil and coolant; and all equipment required for operation and required by this Specification, but without passengers or driver.

dBA: Decibels with reference to 0.0002 microbar as measured on the "A" scale.

DC to DC Converter: A module that converts a source of direct current from one voltage level to another.

Default Configuration Bus: The bus described if no alternatives are selected. Signing, colors, the destination sign reading list and other information must be provided by the Agency.

Defueling: The process of removing fuel from a tank.

Defueling Port. Device that allows for vehicle defueling, or the point at which this occurs.

Destroyed: Physically made permanently unusable.

Discrete Signal: A signal that can take only pre-defined values, usually of a binary 0 or 1 nature, where 0 is battery ground potential and 1 is a defined battery positive potential.

DPF: Diesel particulate filter.

Driver's Eye Range: The 95th-percentile ellipse defined in SAE Recommended Practice J941, except that the height of the ellipse shall be determined from the seat at its reference height.

Energy Density: The relationship between the weight of an energy storage device and its power output in units of watt-hours per kilogram (Wh/kg).

Energy Storage System (ESS): A component or system of components that stores energy and for which its supply of energy is rechargeable by the on-vehicle system (engine/regenerative braking/ generator) or an off-vehicle energy source.

Fusible Material: A metal, alloy or other material capable of being melted by heat.

Fire Resistant: Materials that have a flame spread index less than 150 as measured in a radiant panel flame test per ASTM-E 162-90.

Fireproof: Materials that will not burn or melt at temperatures less than 2000°F.

Free Floor Space: Floor area available to standees, excluding the area under seats, area occupied by feet of seated passengers, the vestibule area forward of the standee line, and any floor space indicated by manufacturer as non-standee areas, such as the floor space "swept" by passenger doors during operation. Floor area of 1.5 sq.ft. shall be allocated for the feet of each seated passenger protruding into the standee area.

Fuel Management System: fuel system components that control or contribute to engine air fuel mixing and metering, and the ignition and combustion of a given air-fuel mixture. The fuel management system would include, but is not limited to, reducer/regulator valves, fuel metering equipment (e.g. carburetor, injectors), sensors (e.g., main throttle, waste gate).

GAWR (Gross Axle Weight Rated): The maximum total weight as determined by the axle manufacturer, at which the axle can be safely and reliably operated for its intended purpose.

Gross Load: 150lbs for every designed passenger seating position, for the driver, and for each 1.5 sq.ft. of free floor space.

GVW (Gross Vehicle Weight): Curb weight plus gross load.

GVWR (Gross Vehicle Weight Rated): The maximum total weight as determined by the vehicle manufacturer, at which the vehicle can be safely and reliably operated for its intended purpose.

High Voltage (HV): Greater than 50 V (AC and DC).

Hose: Flexible line.

Hybrid: A vehicle that uses two or more distinct power sources to propel the vehicle.

Hybrid System Controller (HSC): Regulates energy flow throughout hybrid system components in order to provide motive performance and accessory loads, as applicable, while maintaining critical system parameters (voltages, currents, temperatures, etc.) within specified operating ranges.

Hybrid Drive System (HDS): The mechanical and/or electromechanical components, including the engine, traction motors and energy storage system, which comprise the traction drive portion of the hybrid propulsion system.

Inverter: A module that converts DC to and from AC.

Labeled: Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization, which is acceptable to the authority having jurisdiction and concerned with product evaluation, which maintains periodic inspection of production labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Leakage: Release of contents through a Defect or a crack. See *Rupture*.

Line: All tubes, flexible and hard, that carry fluids.

Liner: Inner gas-tight container or gas container to which the overwrap is applied.

Local Regulations: Regulations below the state level.

Low-Floor Bus: A bus that, between at least the front (entrance) and rear (exit) doors, has a floor sufficiently low and level so as to remove the need for steps in the aisle between the doors and in the vicinity of these doors.

Low Voltage (LV):50 V or less (AC and DC).

Lower Explosive Limit: The lowest concentration of gas where, given an ignition source, combustion is possible.

Maximum Service Temperature: The maximum temperature to which a container/cylinder will be subjected in normal service.

Metallic Hose: A hose whose strength depends primarily on the strength of its metallic parts; it can have metallic liners or covers, or both.

Metering Valve: A valve intended to control the rate of flow.

Module: An assembly of individual components

Motor (Electric): A device that converts electrical energy into mechanical energy.

Motor (Traction): An electric motor used to power the driving wheels of the bus.

Operating Pressure: The varying pressure developed in a container during service.

Physical Layer: The first layer of the seven-layer International Standards Organization (ISO) Open Systems Interconnect (OSI) reference model. This provides the mechanical, electrical, functional and procedural characteristics required to gain access to the transmission medium (e.g., cable) and is responsible for transporting binary information between computerized systems.

Pipe: Nonflexible line.

Pressure Relief Device (PRD):A pressure and/or temperature activated device used to vent the container/cylinder contents and thereby prevent rupture of an NGV fuel container/cylinder, when subjected to a standard fire test as required by fuel container/cylinder standards.

> **NOTE:** Since this is a pressure-activated device, it may not protect against rupture of the container when the application of heat weakens the container to the point where its rupture pressure is less than the rated burst pressure of the relief device, particularly if the container is partially full.

Power: Work or energy divided by time

Power Density: Power divided by mass, volume or area.

Propulsion System: System that provides propulsion for the vehicle proportional to operator commands. Includes, as applicable, engine, transmission, traction motors, the hybrid drive system, (HDS), energy storage system (ESS), and system controllers including all wiring and converter/inverter.

Real-Time Clock (RTC): Computer clock that keeps track of the current time.

Regenerative Braking: Deceleration of the bus by switching motors to act as generators, which return vehicle kinetic energy to the energy storage system.

Rejectable Damage: In terms of NGV fuel containers/cylinders, this is damage as outlined in CGA C-6.4, "Methods for External Visual Inspection of Natural Gas Vehicle Fuel Containers and Their Installations," and in agreement with the manufacturer's recommendations.

Retarder: Device used to augment or replace some of the functions of primary friction based braking systems of the bus.

Rupture: Sudden and unstable damage propagation in the structural components of the container resulting in a loss of contents. See *Leakage*.

Seated Load: 150lbs for every designed passenger seating position and for the driver.

SLW (Seated Load Weight): Curb weight plus seated load.

Serial Data Signals. A current loop based representation of ASCII or alphanumeric data used for transferring information between devices by transmitting a sequence of individual bits in a prearranged order of significance.

> **NOTE:** An example is the communication that takes place between two or more electronic components with the ability to process and store information.

Service Pressure: The settled pressure at a uniform gas temperature of 21°C (70°F) and full gas content. It is the pressure for which the equipment has been constructed, under normal conditions. Also referred to as the nominal service pressure or working pressure.

Settled Pressure: The gas pressure when a given settled temperature, usually 21°C (70°F), is reached.

Settled Temperature: The uniform gas temperature after any change in temperature caused by filling has dissipated.

Solid State Alternator: A module that converts high-voltage DC to low-voltage DC (typically 12/24 V systems).

Sources of Ignition: Devices or equipment that because of their modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable fuel-air mixtures when introduced into such a mixture, or when such a mixture comes into contact with them.

Special Tools: Tools not normally stocked by the Agency.

Specification: A particular or detailed statement, account or listing of the various elements, materials, dimensions, etc. involved in the manufacturing and construction of a product.

Standard: A firm guideline from a consensus group. Standards referenced in "Section 6: Technical Specifications" are the latest revisions unless otherwise stated.

Standee Line: A line marked across the bus aisle to designate the forward area that passengers may not occupy when the bus is moving.

State of Charge (SOC): Quantity of electric energy remaining in the battery relative to the maximum rated amp-hour (Ah) capacity of the battery expressed in a percentage. This is a dynamic measurement used for the energy storage system. A full SOC indicates that the energy storage system cannot accept further charging from the engine-driven generator or the regenerative braking system.

Stress Loops: The "pigtails" commonly used to absorb flexing in piping.

Structure: The basic body, including floor deck material and installation, load-bearing external panels, structural components, axle mounting provisions and suspension beams and attachment points.

Thermally Activated Gas Relief Device: A relief device that is activated by high temperatures and generally contains a fusible material.

> **NOTE:** Since this is a thermally activated device, it does not protect against over-pressure from improper charging practices.

Wheelchair: A mobility aid belonging to any class of three- or four-wheeled devices, usable indoors, designed for and used by individuals with mobility impairments, whether operated manually or powered. A "common wheelchair" is such a device that does not exceed 30 in. in width and 48 in. in length measured 2 in. above the ground, and does not weigh more than 600 lbs. when occupied.

TS 3 Referenced Publications

The documents or portions thereof referenced within this specification shall be considered part of the requirements of the specification. The edition indicated for each referenced document is the current edition, as of the date of the APTA issuance of this specification.

TS 4 Legal Requirements

The Contractor shall comply with all applicable federal, state and local regulations. These shall include but not be limited to ADA, as well as state and local accessibility, safety and security requirements. Local regulations are defined as those below the state level.

Buses shall meet all applicable FMVSS regulations and shall accommodate all applicable FMCSR regulations in effect at the location of the Agency and the date of manufacture.

In the event of any conflict between the requirements of these specifications and any applicable legal requirement, the legal requirement shall prevail. Technical requirements that exceed the legal requirements are not considered to conflict.

TS 5 Overall Requirements

The Contractor shall ensure that the application and installation of major bus subcomponents and systems are compliant with all such subcomponent vendors' requirements and recommendations. Contractor and Agency shall identify subcomponent vendors that shall submit installation/application approval documents with the completion of a pilot or lead bus. Components used in the vehicle shall be of heavy-duty design and proven in transit service.

TS 5.1 Weight

Curb weight of the bus, as defined in TS2 of these specifications, shall be such that the bus is as light in weight as possible without degradation of safety, appearance, comfort, traction or performance.

Buses at a capacity load shall not exceed the tire factor limits, brake test criteria or structural design criteria.

TS 5.2 Capacity

The vehicle shall be designed to carry the gross vehicle weight, as defined in TS2, which shall not exceed the bus GVWR. The vehicle shall not exceed the individual gross axle weight rating (GAWR) at curb weight plus gross load.

TS 5.3 Service Life

The minimum useful design life of the bus in transit service shall be at least twelve (12) years or 500,000 miles. It shall be capable of operating at least 40,000 miles per year, including the 12th year.

TS 5.4 Maintenance and Inspection

Scheduled maintenance tasks shall be related and shall be in accordance with the manufacturer's recommended preventative maintenance schedule (along with routine daily service performed during the fueling operations).

Test ports, as required, shall be provided for commonly checked functions on the bus, such as air intake, exhaust, hydraulic, pneumatic, charge-air and engine cooling systems. Power receptacles (12VDC power supply) shall be available for laptop plug-in at engine and at the interior bus street side (behind the Operator's barrier) locations.

The coach manufacturer shall give prime consideration to the routine problems of maintaining the vehicle. All coach components and systems, both mechanical and electrical, which will require periodic physical Work or inspection processes, shall be installed so that a minimum of time is consumed in gaining access to the critical repair areas. It shall not be necessary to disassemble portions of the coach structure and/or equipment such as seats and flooring under seats in order to gain access to these areas. Each coach shall be designed to facilitate the disassembly, reassembly, servicing or maintenance, using tools and equipment that are normally available as standard commercial items.

Requirements for the use of unique specialized tools will be minimized. The body and structure of the coach shall be designed for ease of maintenance and repair. Individual panels or other equipment that may be damaged in normal service shall be repairable or replaceable. Ease of repair shall be related to the vulnerability of the item to damage in service.

Contractor shall provide a list of all special tools and pricing required for maintaining this equipment. Said list shall be submitted as a supplement to the Pricing Schedule.

> **NOTE: Tools such as compartment door keys, bellows gauges and other tools that are required for daily maintenance and inspections shall not be included in the special tool list and shall be furnished for each coach.**

TS 5.5 Interchangeability

Unless otherwise agreed, all units and components procured under this Contract, whether provided by Suppliers or manufactured by the Contractor, shall be duplicates in design, manufacture and installation to ensure interchangeability among buses in each order group in this procurement. This interchangeability shall extend to the individual components as well as to their locations in the buses. These components shall include, but are not limited to, passenger window hardware, interior trim, lamps, lamp lenses and seat assemblies. Components with non-identical functions shall not be, or appear to be, interchangeable.

Any one component or unit used in the construction of these buses shall be an exact duplicate in design, manufacture and assembly for each bus in each order group in this Contract. Contractor shall identify and secure approval for any changes in components or unit construction provided within a Contract.

In the event that the Contractor is unable to comply with the interchangeability requirement, the Contractor must notify the Agency and obtain the Agency's prior written approval, including any changes in pricing.

Agency shall review proposed product changes on a case-by-case basis and shall have the right to require extended warranties to ensure that product changes perform at least as well as the originally supplied products.

TS 5.6 Training

> **NOTE: The following is illustrative; the Agency should carefully specify its training requirements.**

The Contractor shall have at least one qualified instructor who shall be available at the Agency's property for **a minimum of 200 hours to be conducted within 120** calendar days between the hours of **8:00 am – 5:00 pm**, **to begin within 30 days** after, acceptance of the first bus. Instructor(s) shall conduct schools and advise the personnel of the Agency on the proper operation and maintenance of the equipment. The Contractor also shall provide visual and other teaching aids (such as three (3) copies of all manuals, slide presentations, three (3) copies of all electronic manual and literature) for use by the Agency's own training staff, which becomes the property of the Agency.

- **40 HOURS MINIMAL OF MAINTENANCE TRAINING**
- **3 PAPER COPIES OF ALL MANUALS**
- **3 DIGITAL COPIES OF ALL MANUALS**

TS 5.6.1 Technical/Service Representatives

The Contractor shall, at its own expense, have one or more competent technical service representatives available on request to assist the Agency in the solution of engineering or design problems within the scope of the specifications that may arise during the warranty period. This does not relieve the Contractor of responsibilities under the provisions of "Section 7: Warranty Requirements."

TS 5.7 Operating Environment

DEFAULT

The bus shall achieve normal operation in ambient temperature ranges of 10 ºF to 115 ºF, at relative humidity between 5 percent and 100 percent, and at altitudes up to 3000 ft. above sea level. Degradation of performance due to atmospheric conditions shall be minimized at temperatures below 10 °F, above 115 °F or at altitudes above 3000 ft. Altitude requirements above 3000 ft. will need separate discussions with the engine manufacturer to ensure that performance requirements are not compromised. Speed, gradability and acceleration performance requirements shall be met at, or corrected to, 77 °F, 29.31 in. Hg, dry air per SAEJ1995.

ALTERNATIVE

The bus shall achieve normal operations as stated above at altitudes of up to 850 feet

TS 5.8 Noise

TS 5.8.1 Interior Noise

The combination of inner and outer panels and any material used between them shall provide sufficient sound insulation so that a sound source with a level of 80 dBA measured at the outside skin of the bus shall have a sound level of 65 dBA or less at any point inside the bus. These conditions shall prevail with all openings, including doors and windows, closed and with the engine and accessories switched off.

The bus-generated noise level experienced by a passenger at any seat location in the bus shall not exceed 80 dBA. The driver area shall not experience a noise level of more than 75 dBA. Measurements of interior noise levels shall be taken in accordance with SAEJ2805. An exception shall be made for the turntable area, which shall be considered a separate environment.

TS 5.8.2 Exterior Noise

Airborne noise generated by the bus and measured from either side shall not exceed 80dBA under full power acceleration when operated at 0 to 35 mph at curb weight. The maximum noise level generated by the bus pulling away from a stop at full power shall not exceed 83 dBA. The bus-generated noise at curb idle shall not exceed 65dBA.If the noise contains an audible discrete frequency, a penalty of 5 dBA shall be added to the sound level measured. The Contractor shall

comply with the exterior noise requirements defined in local laws and ordinances identified by the Agency andSAEJ366.

DEFAULT

Noise level should be as stated.

TS 5.9 Fire Safety

The bus shall be designed and manufactured in accordance with all applicable fire safety and smoke emission regulations. These provisions shall include the use of fire-retardant/low-smoke materials, fire detection systems, bulkheads and facilitation of passenger evacuation.

TS 5.9.1 Materials

DEFAULT

All materials used in the construction of the passenger compartment of the bus shall be in accordance with the Recommended Fire Safety Practices defined in FMVSS 302.

TS 5.10 Fire Suppression

DEFAULT

No fire suppression system shall be required so long as the battery management system is capable of thermally monitoring the internal temperature with redundant sensors internal to the battery packs. If the temperatures become high enough to affect performance, the Battery Management System shall be required to de-rate power until the temperature is reduced. If the temperatures were to continue rising, the control system shall be required to disable the vehicle.

TS 5.11 Respect for the Environment

In the design and manufacture of the bus, the Contractor shall make every effort to reduce the amount of potentially hazardous waste. In accordance with Section 6002 of the Resource Conservation and Recovery Act, the Contractor shall use, whenever possible and allowed by the specifications, recycled materials in the manufacture of the bus.

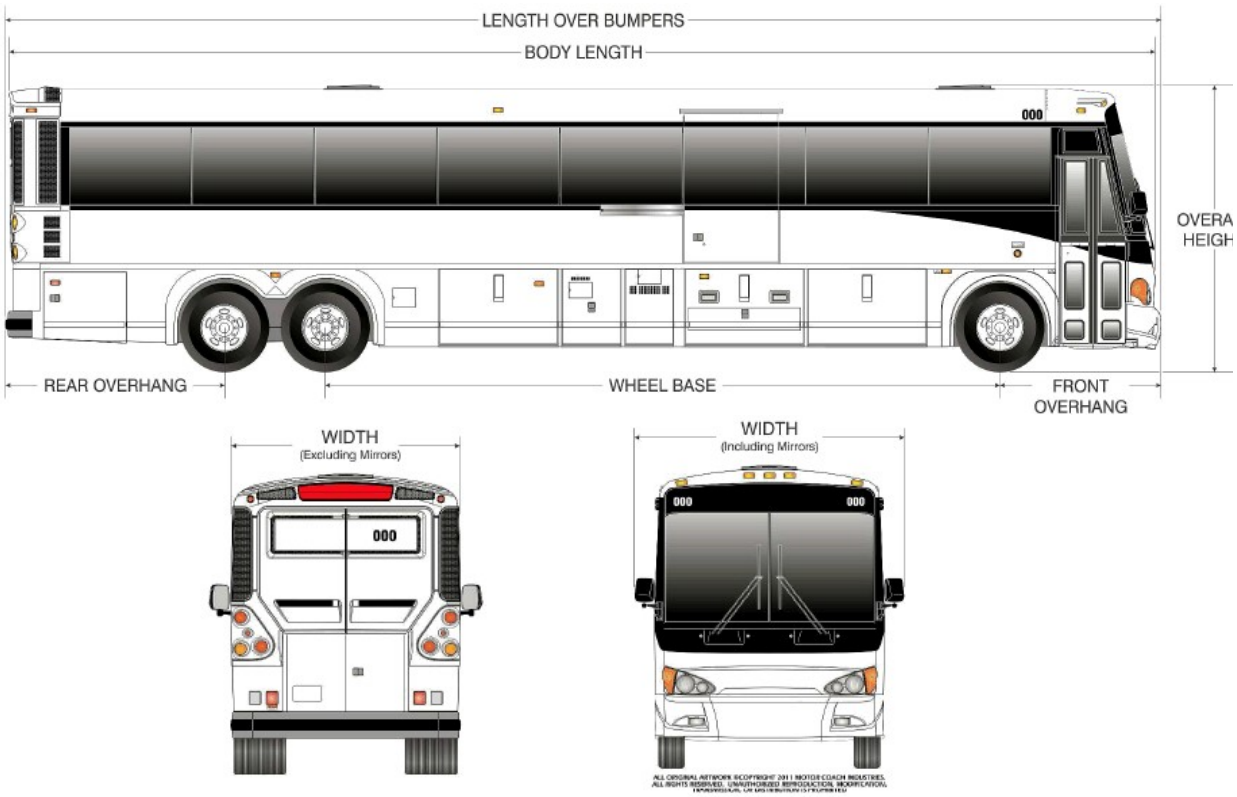
DIMENSIONS

TS 6 Physical Size

With exceptions such as exterior mirrors, marker and signal lights, bumpers, fender skirts, washers, wipers, ad frames, cameras, object detection systems, bicycle racks, feelers and rub rails,

the bus shall have the following overall dimensions as shown in **Figure 1**at static conditions and design height.

FIGURE 1
Transit Bus Exterior Dimensions



TS 6.1 Bus Length

For ease of use, the following tolerances will be allowable for each given bus length. Bus length is determined as the measurement from bumper to bumper.

- **30ft bus:**29 ft., 11 in. to 34 ft., 11 in.
- **35ft bus:**35 ft. to 39 ft., 11 in.
- **40ft bus:** 40 ft. to 44 ft. 11 in.
- **45ft bus:** 45 ft. to 47 ft.
- **60ft (articulated) bus:** 59 ft. to 65 ft.

TS 6.2 Bus Width

TS 6.2.1 Transit Coach

DEFAULT

102 in. Width Bus

Body width shall be 102 in. (+0, -1 in.).

TS 6.3 Bus Height

DEFAULT

Maximum Overall Height

Maximum overall height shall be 140 in., including all rigid, roof-mounted items such as A/C, exhaust, fuel system and cover, etc.

TS 6.4 Step Height

TS 6.4.1 Transit Coach

The step height shall not exceed 16.5 in. at either doorway without kneeling and shall not exceed 15.5 in. at the step. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.

TS 6.5 Underbody Clearance

The bus shall maintain the minimum clearance dimensions as defined and shown in Figure 2 of SAE Standard J689, regardless of load up to the gross vehicle weight rating.

TS 6.6 Ramp Clearances

The approach angle is the angle measured between a line tangent to the front tire static loaded radius arc and the initial point of structural interference forward of the front tire to the ground.

The departure angle is the angle measured between a line tangent to the rear tire static loaded radius arc and the initial point of structural interference rearward of the rear tire to the ground.

The breakover angle is the angle measured between two lines tangent to the front and rear tire static loaded radius and intersecting at a point on the underside of the vehicle that defines the largest ramp over which the vehicle can roll.

DEFAULT

Refer to **Table 2a**.

TABLE 2a

Default Breakover Angle

Angle	30 to 45ft Bus	60ft Bus
Approach	8.6 deg (min.)	8.6 deg (min.)
Front breakover	8 deg (min.)	10.2 deg (min.)
Rear breakover (articulated only)	n/a	8.7 deg (min.)
Departure	8.6 deg (min.)	8.6 deg (min.)

TS 6.7 Ground Clearance

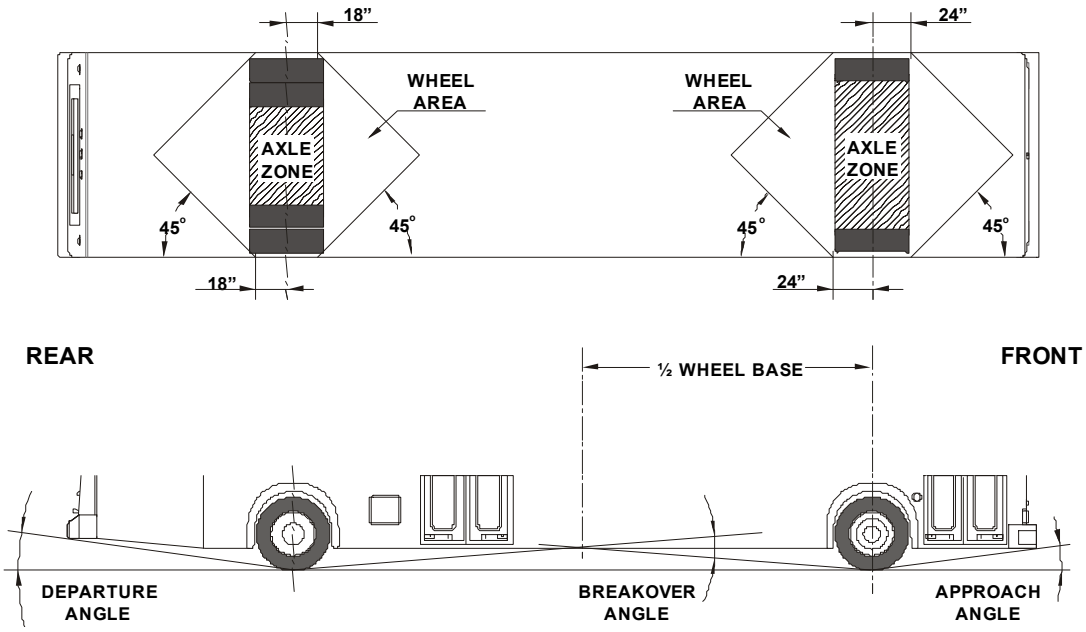
Ground clearance shall be no less than 9 in., (8 in. at jacking pad) except within the axle zone and wheel area.

Axle zone clearance, which is the projected area between tires and wheels on the same axial centerline, shall be no less than 5.4 in.

Wheel area clearance shall be no less than 8 in. for parts fixed to the bus body and 6 in. for parts that move vertically with the axles.

– **FIGURE 2**

Transit Bus Minimum Road Clearance



TS 6.8 Floor Height

TS 6.8.1 Transit Coach

Height of the step above the street shall be no more than 16 in. measured at the centerline of the front and rear doorway. All floor measurements shall be with the bus at the design running height and on a level surface and with the standard installed tires. A maximum of two steps are allowed to accommodate a raised aisle floor in the rear of the bus.

TS 6.9 Interior Headroom

Headroom above the aisle and at the centerline of the aisle seats shall be no less than 78 in. in the forward half of the bus tapering to no less than 74 in. forward of the rear settee. At the centerline of the window seats, headroom shall be no lower than 65 in., except for parcel racks and reading lights, if specified. Headroom at the back of the rear bench seat may be reduced to a minimum of 56 in., but it shall increase to the ceiling height at the front of the seat cushion. In any area of the

bus directly over the head of a seated passenger and positioned where a passenger entering or leaving the seat is prone to strike his or her head, padding shall be provided on the overhead paneling.

VEHICLE PERFORMANCE

TS 7. Power Requirements

The propulsion system shall be sized to provide sufficient power to enable the bus to meet the defined acceleration, top speed and gradability requirements, and operate all propulsion-driven accessories using actual road test results and computerized vehicle performance data.

TS 7.1 Top Speed

ALTERNATIVE

Agency to specify top speed limit. The bus shall be capable of achieving a top speed of 62 MPH on a straight, level road at GVWR with all accessories running. The bus shall be capable of safely maintaining the vehicle speed according to the recommendations by the tire manufacturer.

NOTE: Values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

TS 7.2 Gradability

Gradability requirements shall be met on grades with a dry commercial asphalt or concrete pavement at GVWR with all accessories operating.

ALTERNATIVE

Agency will provide operating profile information to the Contractor. The propulsion system shall enable the bus to achieve and maintain a speed of 40 mph on a 2 ½% ascending grade.

NOTE: Values are assumed to be sustained. Manufacturer shall supply Agency with data if there is a variance between peak performance and sustained vehicle performance.

TS 7.3 Acceleration

TS 7.3.1 Non-Hybrid

The acceleration shall meet the requirements in **Table 3**below and shall be sufficiently gradual and smooth to prevent throwing standing passengers off-balance. Acceleration measurement shall commence when the accelerator is depressed.

TABLE 3

Maximum Start Acceleration Times on a Level Surface[1]

Speed (mph)	Maximum time (seconds)
10	5
20	10
30	18

40	30
50	60
Top speed	

1. Vehicle weight = GVWR

TS 7.4 Operating Range

The operating range of the coach shall be designed to meet the operating profile as stated in the "Design Operating Profile" section.

DEFAULT

Long Range, Plug-in Charging Coach:
The operating range of the coach with full state of charge shall be at least 175 miles. The Contractor shall include a calculation of its operating range by identifying the coach's Usable Battery Capacity divided by its Overall Average Consumption fuel efficiency recorded at Altoona.
Restricted Range, On-Route Charging Coach:
The operating range of the coach with full state of charge shall be at least 35 miles. The Contractor shall include a calculation of its operating range by identifying the coach's Usable Battery Capacity divided by its Overall Average Consumption fuel efficiency recorded at Altoona.

TS 8. Fuel Economy (Design Operating Profile)

Test results from the Altoona fuel economy tests or other applicable test procedures shall be provided to the Agency. Results shall include vehicle configuration and test environment information. Fuel economy data shall be provided for each design operating profile. The design operating profile is assumed to be defined by the Altoona fuel duty cycle.
Fuel economy tests shall be run on these three duty cycles: CBD, Arterial, and Commuter.

POWERPLANT

TS 9. Propulsion System (Electric)

Propulsion System Description

The bus shall be powered by a battery electric propulsion system. The propulsion system shall utilize an appropriately sized permanent magnet (PM) traction motor. The propulsion system shall comply with applicable local, state, and/or federal emissions and useful life requirements, as a zero emission bus. The propulsion system shall be rated for the GVWR or greater of the bus.

Propulsion Control System

The drive motor shall be equipped with an electronically controlled management system, compatible with 12-volt power distribution. The motor control system shall be capable of transmitting and receiving electronic inputs and data from other drivetrain components, and broadcasting that data to other vehicle systems. Communication between electronic drivetrain components and other vehicle systems shall be made using the communications networks.

The battery electric drive system shall have onboard diagnostic capabilities able to monitor vital motor functions, store and time stamp parameter conditions in memory, and communicate faults and vital conditions to service personnel. Diagnostic reader device connector ports, suitably protected against dirt and moisture, shall be provided in the operator's area. The onboard diagnostic system shall inform the operator via visual and/or audible alarms when out of parameter conditions exist for vital engine functions. The on-board diagnostic system shall have capabilities for storing hard and soft codes and processing data and provide detailed information/reports on various aspects of fleet usage. The information shall be retrievable via cabling or wireless transmission to a laptop.

The motor drive shall protect the drive system against progressive damage. The system shall monitor conditions critical for safe operation and automatically de-rate power and/or speed and initiate motor shutdown as needed. The on-board diagnostic system shall trigger a visual and audible alarm to the operator when the motor control unit detects a malfunction and the engine protection system is activated.

Automatic shutdown shall only occur when parameters established for the functions below are exceeded:

- Over Temp
- Inverter Fault
- Over Voltage
- Broken Wire
- Loss of Electrical Communications
- Communications Safety
- No redundant bus manufacturer and/or component manufacturer "detection and shutdown" circuits. By default, the component manufacturer's software shall be used to record fault codes.

A control shall be available to the operator to allow a 30-second override, which, when depressed, will allow the operator to delay the drive system shutdown but not the activation and alarm system.

Propulsion System Service

The PM motor shall be designed to operate for not less than 300,000 miles without major failure or significant deterioration. Components of the control system shall be designed to operate for not less than 150,000 miles without replacement or major service.

The propulsion system shall be arranged so that accessibility for all routine maintenance is assured. No special tools, other than dollies and hoists, shall be required to remove the propulsion system or any subsystems. However, the Agency shall recognize that properly rated test equipment and safe electrical work practices are essential when servicing high voltage

components. Contractor shall provide all specialty tools and diagnostic equipment required for maintaining the Propulsion System in accordance with Special Tools List.

Energy Storage System

An overview of the design and performance of the Energy Storage System (ESS) shall be provided to the Agency. The ESS shall be capable of operating in the Agency transit environment. The ESS shall be designed, sized, and selected to ensure that the vehicle performance specifications, compatibility with charging, and other related requirements are met or exceeded, bearing in mind cost benefit and reliability variables as they relate to the characteristics of the different battery types. The power source for the vehicle shall be derived from established battery technology that has a field-proven track record of safe, reliable, and durable operation in similar applications.

The primary charging of the energy storage system shall be accomplished by conductive charging as needed to meet the required duty cycle. The charging shall be provided from a stationary charging station via a mechanical or manual conductive interface, i.e., plug. The energy storage system shall also make use of regenerative braking. The Energy Storage System shall comply with UN/DOT 38.3 requirements for lithium batteries or similar standards for non-lithium batteries.

The Contractor shall deliver the buses with an installed, fully-charged, functioning ESS. The ESS shall be fully formed, installed and tested in accordance with the battery manufacturer's recommended practices. The ESS design, including containers, module bracing systems, thermal-management systems, battery management systems, watering/venting systems, interconnections, fusing, and traction-controller and charger interfaces should be completely described in the proposal.

The proposal shall include a detailed analysis of expected battery performance in the Design Operating Profile. The proposal should also include a comprehensive statement of the warranty terms relating to the battery, including explanation of all disclaimers within the warranty. The charge cycle and cycle life should be stated in the proposal and a life cycle cost analysis of the proposed battery system in the specified application should be provided.

The battery system shall be capable of withstanding the high current and voltage profiles necessary to accomplish daily recharge events without reducing the life of the battery.

Energy Storage System Safety

The ESS battery packs shall be located outside the passenger compartment and in a position outside of a direct side or rear impact zone. Additionally, the ESS batteries shall be load distributed within the bus to equalize weight between the wheels on the same axles and to achieve appropriate weight distribution between axles so as not to adversely affect handling of the bus.

The bus body shall be purpose-design and constructed to ensure passengers and the operator will not be exposed to electrical current either in normal operation or in the event of a vehicle accident. Analysis and test data shall be provided to the Agency. The ESS shall be designed and constructed to prevent gassing or fumes from the ESS from entering the interior of the bus, i.e., a vent path to the exterior.

Proposals shall include complete descriptions of all safety standards followed in the design and manufacture of the battery system, safety testing procedures used to validate the safety of battery operation in this application, and documented results of safety testing to confirm that standards have been met.

Battery Management System

As a minimum, the battery management system (BMS) must perform the following functions:

A. The BMS system must be capable of monitoring the voltage level of cells within each battery pack. The BMS must be able to read and store individual battery or block voltages at a frequency of 1 data point per block every 15 seconds. The system must also monitor battery pack temperatures using no fewer than 2 thermocouples placed in and around each battery pack sampled at the same 4 samples per minute frequency.

B. The BMS system must be capable of communicating when a battery fault (as defined by the battery manufacturer) has occurred and must be able to identify and communicate the faulty battery in order to perform maintenance.

C. The BMS system must be capable of engaging prudent safety interlocks when an unsafe battery condition has been detected.

D. The BMS system must be able to monitor the battery state-of charge and update a gauge viewed by the operator at least once every 15 seconds.

E. The BMS system must be able to communicate all data to the bus level information system for storage and communication.

Battery Thermal Management

Battery thermal management must be powered from an onboard source at all times. Thermal management must be continuously monitored at all times with appropriate safety interlocks installed to react to adverse conditions as stated in SAE J1772.

Battery temperatures must never exceed the manufacturer's recommended range during operation in the design operating profile and specified ambient conditions. Battery cooling must be sufficient to prevent the temperature from exceeding the battery manufacturer's recommended maximum temperature when the ambient temperature is above 105 degrees F for a period of 16 hours.

The ESS battery packs shall be cooled via a recirculating air system. This air shall be reconditioned and cooled by a small radiator in each pack that uses a vehicle-based water/glycol cooling system. The vehicle-based system shall include a chiller integrated with the HVAC system that runs as needed to maintain the optimal temperature for the ESS battery packs.

ESS Control System:
The ESS control system shall be a hierarchical control with the energy storage module (ESM) acting as the interface and lead controller to the rest of the battery system. This module shall communicate on the main vehicle CAN bus to interface with the cooling, powertrain, charge and other systems. This module shall also communicate on the separate battery CAN bus with all of

the individual packs. The main controller interface shall exchange information about battery input and output capability as well as cooling needs and diagnostic information.

The ESS battery pack controllers shall gather the current information as well as pack voltage, cell voltage, and temperature information. The master controller shall use this information to compute system limits, determine health, and ultimately apply system-wide boundaries on use. All of the contactors in the system shall have feedback to allow the system to know if there is a potential for high voltage to be present when it shouldn't be. The temperature measurements in the ESS battery pack must be redundant in nature. The ESS battery packs must also include sensors to detect moisture and monitor the current distribution between the pack in order to confirm it's within an acceptable range.

The ESS control system shall provide system discharge limits to ensure that the lowest cell never goes below its minimum and the system charge limit to ensure that the highest cell never goes above its maximum. The system shall also comprehend current imbalance between the packs, temperatures throughout all of the packs, moisture, and isolation detection.

TS 10. Cooling Systems

The cooling systems shall be of sufficient size to maintain all motor, transmissions, controller and battery system fluids at safe, continuous operating temperatures during the most severe operations possible and in accordance with the manufacturers' cooling system requirements. The cooling system fan/fans control should sense the temperatures of the operating fluids and the intake air and if either is above safe operating conditions the cooling fan should be engaged. The fan control system shall be designed with a fail-safe mode of "fan on." The cooling system in new condition shall have an ambient capacity of at least 115° F with water as coolant and sea level operation.

TS 10.1 Propulsion Cooling

The transmission shall be equipped with a standalone oil to air cooler mounted next to the transmission. The Transmission shall also be connected with a Kirk Key Solenoid Switch with Key Code # 21750 to prevent the engagement of the vehicle ability to move in the event the key is removed. This key solenoid is to be mounted in the driver's side console area. Specifics to location to be approved by the Agency.

The drive motor shall be cooled by a liquid-based cooling system that does not permit boiling or coolant loss during operation. The cooling fan shall be temperature controlled, preventing the drive motor from exceeding manufacturer's recommended operating temperatures. The temperature-controlled fan shall idle or not be driven when the coolant temperature falls below the minimum level recommended by the engine manufacture. Air vent valves shall be fitted at high points in the cooling system unless it can be demonstrated that the system is self-purging.

A low-level coolant sensor shall be provided and shall be accessible by an exterior access door at ground level. The sensor shall display both at the filler location as well as on the dash. The water filler shall be no more than 60 inches above the ground and both shall be accessible through the same access door.

The radiator, shall be of durable corrosion-resistant construction with integral tanks, unless the EMP Mini-Hybrid System is installed. Plastic tanks are not permitted. All radiators shall be designed so a mechanic can gain access to a substantial portion for the purpose of cleaning the radiators in five minutes or less.

Radiators with a fin density greater than 12 fins per inch, and louvered/slit designs, are more susceptible to clogging and deteriorating cooling performance over time and shall not be used.

All hose clamps shall be constant tension type clamps.

The radiators shall be designed to withstand thermal fatigue and vibration associated with the installed configuration.

TS 10.2 Radiator Screen

The bus shall be equipped with 2 radiators: one for power electronics and propulsion system; and the other for battery cooling. Both radiators shall be designed to withstand thermal fatigue and vibration associated with the installed configuration. The radiator cores shall be easily cleaned with standard pressure-washing equipment.

TS.11 Power Train Engagement

DEFAULT

A nominal brake pedal application of 6 to 10 psi shall be required by the driver to engage forward or reverse range from the neutral position to prevent sudden acceleration of the bus from a parked position. The Transmission shall also be connected with a Kirk Key Solenoid Switch with Key Code # 21750 to prevent the engagement of the vehicle's ability to move in the event the key is removed. This key solenoid is to be mounted in the driver's side console area. Specifics to location to be approved by the Agency

The electronically controlled transmission shall have on-board diagnostic capabilities, be able to monitor functions, store and time-stamp out-of-parameter conditions in memory, and communicate faults and vital conditions to service personnel. The transmission shall contain built-in protection software to guard against severe damage. The on-board diagnostic system shall trigger a visual alarm to the driver when the electronic control unit detects a malfunction.

An electronic transmission fluid level monitoring and protection system shall be provided.

ALTERNATIVE

Automatic Neutral Function with Automatic Re-Engagement

The transmission, when in forward direction, shall automatically shift the transmission to neutral when the vehicle registers zero road speed, engine is idle and service brakes are applied. If the status of any one or more of the three signals changes, the transmission immediately and automatically resumes forward mode operation.

TS.12 Regenerative Braking (Transit Coach)

The bus shall have a regenerative braking system to aid in the reduction of wear on the brakes and to help extend the range of the vehicle through energy recapture. The vehicle will employ regenerative braking as the accelerator pedal is completely released. Regenerative braking shall be additionally increased as the brake pedal is applied which shall also increase service brake application.

ALTERNATIVE

Brake lights shall illuminate when the retarder is activated.

DEFAULT

Standard Requirement for Retarder Activation

The retarder shall be adjustable within the limits of the power train and activated when the brake pedal is depressed. The Agency will work with the OEM/drive system manufacturer to determine retarder performance settings.

The thermostatically controlled cooling fan shall be activated when the retarder is engaged and the coolant temperature reaches the maximum operating temperature established by the engine and transmission manufacturers.

DEFAULT

Accessible Retarder Disable Switch

Switch shall be located in overhead compartment.

TS.13 Mounting

All power plant mounting shall be mechanically isolated to minimize transfer of vibration to the body structure and provide a minimum clearance of 0.75 in. Mounts shall control the movement of the power plant so as not to affect performance of belt-driven accessories or cause strain in piping and wiring connections to the power plant.

TS 13.1 Service

The propulsion system shall be arranged for ease of access and maintenance. The Contractor shall list all special tools, fixtures or facility requirements recommended for servicing. The muffler, exhaust system, air cleaner, air compressor, starter, alternator, radiator, all accessories and any other component requiring service or replacement shall be easily removable and independent of the engine and transmission removal.

ALTERNATIVE

Unique Fluid (Lubricant) Fillers

The power unit, transmission and hydraulic reservoir shall each incorporate a unique lubricant fill fitting to prevent cross-contamination of lubricant types. Fitting types shall be specified by the Agency.

TS 14 Hydraulic Systems

Hydraulic system service tasks shall be minimized and scheduled no more frequently than those of other major coach systems. All elements of the hydraulic system shall be easily accessible for service or unit replacement. Critical points in the hydraulic system shall be fitted with service

ports so that portable diagnostic equipment may be connected or sensors for an off-board diagnostic system permanently attached to monitor system operation when applicable. A tamper-proof priority system shall prevent the loss of power steering during operation of the bus if other devices are also powered by the hydraulic system.

The hydraulic system shall operate within the allowable temperature range as specified by the lubricant manufacturer.

DEFAULT

No requirement for hydraulic system sensors.

TS 14.1 Fluid Lines

All lines shall be rigidly supported to prevent chafing damage, Fatigue Failures, degradation and tension strain. Lines should be sufficiently flexible to minimize mechanical loads on the components. Lines passing through a panel, frame or bulkhead shall be protected by grommets (or similar devices) that fit snugly to both the line and the perimeter of the hole that the line passes through to prevent chafing and wear. Pipes and fluid hoses shall not be bundled with or used to support electrical wire harnesses.

Lines shall be as short as practicable and shall be routed or shielded so that failure of a line shall not allow the contents to spray or drain onto any component operable above the auto-ignition temperature of the fluid.

All hoses, pipes, lines and fittings shall be specified and installed per the manufacturer's recommendations.

TS 14.2 Fittings and Clamps

All clamps shall maintain a constant tension at all times, expanding and contracting with the line in response to temperature changes and aging of the line material. The lines shall be designed for use in the environment where they are installed (for example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface, and so on).

Compression fittings shall be standardized to prevent the intermixing of components. Compression fitting components from more than one manufacturer shall not be mixed, even if the components are known to be interchangeable.

TS 15 Oil and Hydraulic Lines

Oil and hydraulic lines shall be compatible with the substances they carry. The lines shall be designed and intended for use in the environment where they are installed (for example, high-temperature resistant in the engine compartment, resistant to road salts near the road surface and so on). Lines within the engine compartment shall be composed of steel tubing where practicable, except in locations where flexible lines are required.

Hydraulic lines of the same size and with the same fittings as those on other piping systems of the bus, but not interchangeable, shall be tagged or marked for use on the hydraulic system only.

STRUCTURE

TS 16. General

TS 16.1 Design

The structure of the bus shall be designed to withstand the transit service conditions typical of an urban or intercity duty cycle throughout its service life. The vehicle structural frame shall be designed to operate with minimal maintenance throughout the 12-year design operating profile. The design operating profile specified by the Agency shall be considered for this purpose.

TS 16.2 Altoona Testing

Prior to acceptance of first bus, the vehicle must have completed any FTA-required Altoona testing. Any items that required repeated repairs or replacement must undergo the corrective action with supporting test and analysis. A report clearly describing and explaining the failures and corrective actions taken to ensure that any and all such failures will not occur shall be submitted to the Agency.

ALTERNATIVE

Altoona Test Report Provided to Agency Prior to Start of Bus Production

Prior to the start of any bus manufacturing or assembly processes, the structure of the proposed bus model shall have undergone appropriate structural testing and/or analysis, including the complete regimen of FTA-required Altoona tests. Prior to assembly of the first bus, the OEM shall provide the Agency with a completed report of Altoona testing for the proposed bus model, along with a plan of corrective action to address deficiencies, breakdowns and other issues identified during Altoona testing. The bus model tested shall match the bus model proposed for procurement, including structure, axles and drive train. Base model and partial Altoona test reports are acceptable when the combination of these tests adequately represents the proposed bus model.

TS 16.3 Structural Validation

DEFAULT

Baseline Structural Analysis

The structure of the bus shall have undergone appropriate structural testing and/or analysis. At minimum, appropriate structural testing and analysis shall include Altoona testing or finite element analysis (FEA).

ALTERNATIVE

Detailed Structural Analysis

The structure of the proposed bus model shall have undergone structural testing prior to assembly of the first bus. The OEM shall provide the Agency with completed reports of other structural tests as specified by the Agency.

TS 17. Distortion

The bus, loaded to GVWR and under static conditions, shall not exhibit deflection or deformation that impairs the operation of the steering mechanism, doors, windows, passenger escape

mechanisms or service doors. Static conditions shall include the vehicle at rest with any one wheel or dual set of wheels on a 6 in. curb or in a 6 in. deep hole.

TS 18. Resonance and Vibration

All structure, body and panel-bending mode frequencies, including vertical, lateral and torsional modes, shall be sufficiently removed from all primary excitation frequencies to minimize audible, visible or sensible resonant vibrations during normal service.

TS 18.1 Engine Compartment Bulkheads

The passenger and engine compartment shall be separated by fire-resistant bulkheads. The engine compartment shall include areas where the engine and exhaust system are housed. This bulkhead shall preclude or retard propagation of an engine compartment fire into the passenger compartment and shall be in accordance with the Recommended Fire Safety Practices defined in FTA Docket 90A, dated October 20, 1993. Only necessary openings shall be allowed in the bulkhead, and these shall be fire-resistant. Any passageways for the climate control system air shall be separated from the engine compartment by fire-resistant material. Piping through the bulkhead shall have fire-resistant fittings sealed at the bulkhead. Wiring may pass through the bulkhead only if connectors or other means are provided to prevent or retard fire propagation through the bulkhead. Engine access panels in the bulkhead shall be fabricated of fire-resistant material and secured with fire-resistant fasteners. These panels, their fasteners and the bulkhead shall be constructed and reinforced to minimize warping of the panels during a fire that will compromise the integrity of the bulkhead.

TS 18.2 Crashworthiness (Transit Coach)

The bus body and roof structure shall withstand a static load equal to 150 percent of the curb weight evenly distributed on the roof with no more than a 6 in. reduction in any interior dimension. Windows shall remain in place and shall not open under such a load. These requirements must be met without the roof-mounted equipment installed.

The bus shall withstand a 25 mph impact by a 4000lb automobile at any side, excluding doorways, along either side of the bus and the articulated joint, if applicable, with no more than 3 in. of permanent structural deformation at seated passenger hip height. This impact shall not result in sharp edges or protrusions in the bus interior.

Exterior panels below 35 in. from ground level shall withstand a static load of 2000 lbs. applied perpendicular to the bus by a pad no larger than 5 sq. in. This load shall not result in deformation that prevents installation of new exterior panels to restore the original appearance of the bus.

TS 19 Corrosion

The bus flooring, sides, roof, understructure and axle suspension components shall be designed to resist corrosion or deterioration from atmospheric conditions and de-icing materials for a period of 12 years or 500,000 miles, whichever comes first. It shall maintain structural integrity and nearly maintain original appearance throughout its service life, with the Agency's use of proper cleaning and neutralizing agents.

All materials that are not inherently corrosion resistant shall be protected with corrosion-resistant coatings. All joints and connections of dissimilar metals shall be corrosion resistant and shall be protected from galvanic corrosion. Representative samples of all materials and connections shall

withstand a two-week (336-hour) salt spray test in accordance with ASTM Procedure B-117 with no structural detrimental effects to normally visible surfaces and no weight loss of over 1 percent.

ALTERNATIVE

Corrosion Resistance Requirements

All exposed surfaces and the interior surfaces of tubing and other enclosed members shall be corrosion resistant through application of a corrosion protection system.

TS 20. Towing

Each towing device shall withstand, without permanent deformation, tension loads up to 1.2 times the curb weight of the bus within 20 deg of the longitudinal axis of the bus. If applicable, the rear towing device(s) shall not provide a toehold for unauthorized riders. The method of attaching the towing device shall not require the removal, or disconnection, of front suspension or steering components. Removal of the bike rack is permitted for attachment of towing devices.

DEFAULT

Shop air connectors shall be provided at the front and rear of the bus and shall be capable of supplying all pneumatic systems of the bus with externally sourced compressed air. The location of these shop air connectors shall facilitate towing operations.

TS 21. Jacking

It shall be possible to safely jack up the bus, at curb weight, with a common 10-ton floor jack with or without special adapter, when a tire or dual set is completely flat and the bus is on a level, hard surface, without crawling under any portion of the bus. Jacking from a single point shall permit raising the bus sufficiently high to remove and reinstall a wheel and tire assembly. Jacking pads located on the axle or suspension near the wheels shall permit easy and safe jacking with the flat tire or dual set on a 6 in. high run-up block not wider than a single tire. The bus shall withstand such jacking at any one or any combination of wheel locations without permanent deformation or damage.

DEFAULT

Yellow Pads

Jacking pads shall be painted safety yellow.

ALTERNATIVE

Decals

Apply decals to identify location of jacking pads.

TS 22. Hoisting

The bus axles or jacking plates shall accommodate the lifting pads of a two-post (or three-post if 60 ft. articulated bus) hoist system. Jacking plates, if used as hoisting pads, shall be designed to

prevent the bus from falling off the hoist. Other pads or the bus structure shall support the bus on jack stands independent of the hoist.

The vehicle shall be capable of lifting by the wheels, and, as necessary to meet tire load requirements, the proper number for wheel lifts and/or adapters must be used.

TS 23. Floor

TS 23.1 Design (Transit Coach)

The floor shall be essentially a continuous plane, except at the wheel housings and platforms. Where the floor meets the walls of the bus, as well as other vertical surfaces such as platform risers, the surface edges shall be blended with a circular section of radius not less than ¼ in. or installed in a fully sealed butt joint. Similarly, a molding or cover shall prevent debris accumulation between the floor and wheel housings. The vehicle floor in the area of the entrance and exit doors shall have a lateral slope not exceeding 2degto allow for drainage.

DEFAULT

Bi-Level Floor Design

The floor design shall consist of two levels (bi-level construction). Aft of the rear door extending to the rear settee riser, the floor height may be raised to a height no more than 21 in. above the lower level, with equally spaced steps. An increase slope shall be allowed on the upper level, not to exceed 3.5 deg off the horizontal.

ALTERNATIVE

Sloped Floor Design

The floor of the bus shall be of a sloped low-floor design. Aft of the rear door extending to the rear settee riser, the floor may be sloped but shall not exceed 5.5 deg off the horizontal.

TS 23.2 Strength

The floor deck may be integral with the basic structure or mounted on the structure securely to prevent chafing or horizontal movement and designed to last the life of the bus. Sheet metal screws shall not be used to retain the floor, and all floor fasteners shall be serviceable from one side only. Any adhesives, bolts or screws used to secure the floor to the structure shall last and remain effective throughout the life of the coach. Tapping plates, if used for the floor fasteners, shall be no less than the same thickness as a standard nut, and all floor fasteners shall be secured and protected from corrosion for the service life of the bus.

The floor deck shall be reinforced as needed to support passenger loads. At GVWR, the floor shall have an elastic deflection of no more than 0.60 in. from the normal plane. The floor shall withstand the application of 2.5 times gross load weight without permanent detrimental deformation. The floor, with coverings applied, shall withstand a static load of at least 150 lbs. applied through the flat end of a ½ in. diameter rod, with 1/32 in. radius, without permanent visible deformation.

TS 23.3 Construction

The floor shall consist of the subfloor and the floor covering that will last the life of the bus**.** **Floor covering shall be Wood grain Flooring or approved equal.** The floor as assembled,

including the sealer, attachments and covering, shall be waterproof, non-hygroscopic and resistant to mold growth. The subfloor shall be resistant to the effects of moisture, including decay (dry rot). It shall be impervious to wood-destroying insects such as termites.

DEFAULT

Pressure-Preserved Plywood Panel

Plywood shall be certified at the time of manufacturing by an industry-approved third-party inspection agency such as APA – The Engineered Wood Association (formerly the American Plywood Association).Plywood shall be of a thickness adequate to support design loads, manufactured with exterior glue, satisfy the requirements of a Group I Western panel as defined in PS 1-95 (Voluntary Product Standard PS 1-95, "Construction and Industrial Plywood") and be of a grade that is manufactured with a solid face and back. Plywood shall be installed with the highest-grade, veneer side up. Plywood shall be pressure-treated with a preservative chemical and process such as alkaline copper quaternary (ACQ) that prevents decay and damage by insects. Preservative treatments shall utilize no EPA-listed hazardous chemicals. The concentration of preservative chemicals shall be equal to or greater than required for an above ground level application. Treated plywood will be certified for preservative penetration and retention by a third-party inspection agency. Pressure-preservative treated plywood shall have a moisture content at or below 15 percent.

ALTERNATIVE

Flooring with manufactured noise-reduction characteristics.

TS 24. Platforms

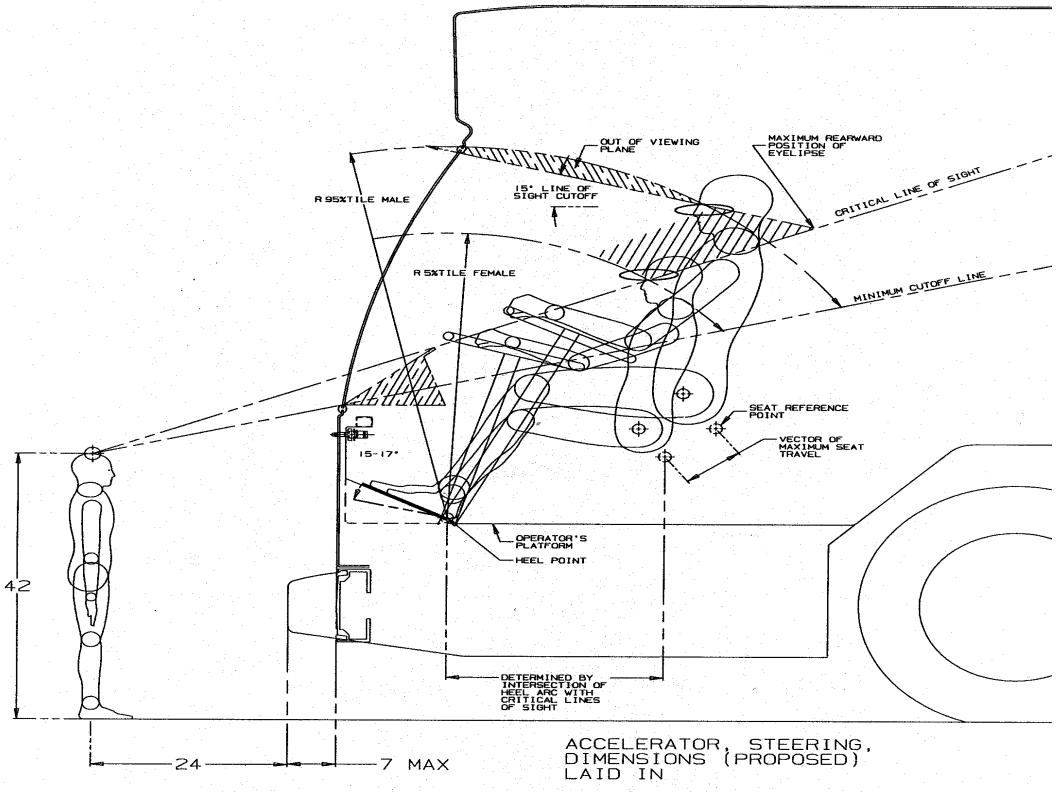
TS 24.1 Driver's Area

The covering of platform surfaces and risers, except where otherwise indicated, shall be the same material as specified for floor covering. Trim shall be provided along top edges of platforms unless integral nosing is provided.

TS 24.2 Driver's Platform

The driver's platform shall be of a height such that, in a seated position, the driver can see an object located at an elevation of 42 in. above the road surface, 24 in. from the leading edge of the bumper. Notwithstanding this requirement, the platform height shall not position the driver such that the driver's vertical upward view is less than 15 deg. A warning decal or sign shall be provided to alert the driver to the change in floor level. **Figure 2**illustrates a means by which the platform height can be determined, using the critical line of sight.

FIGURE 2
Determining Platform Height



TS 24.3 Farebox

Farebox placement should minimize impact to passenger access and minimize interference with the driver's line of sight. Farebox OCU to be mounted to Dash and to be user friendly to the Driver. Farebox will be a Genfare Fast Fare that is updated to Trinity Metro Current Specs. Farebox wiring provision shall be installed in the vestibule area just behind the dashboard and to the right of the driver's enclosure. A 12 VDC power wire and ground, 14-gauge, shall be connected to the Farebox. This wire shall include a 20-amp circuit breaker and be controlled by Charge Guard. Farebox will have J1708 and Ethernet communication connection to Radio Box. The circuit breaker shall be installed in the radio compartment. Additionally, a 14-gauge ground wire shall be provided for the farebox. A 10 –gauge Green wire will be provided as a chassis ground for the farebox connecting to a ground bus bar. Farebox to be 40" Tall Farebox with Trinity Metro current Firmware installed. TRIM to have Version #255 Firmware installed.

Passenger handrail will facilitate installation of the farebox in a manner that allows maximum clearance in the vestibule for passenger entrance and exit and must meet ADA specifications. The handrail must not interfere with routine maintenance, TRIM and cashbox removal on the farebox. The pedestal shall be located so that when the farebox is installed with the trim units there will be no interference with the dash, handrails, or any other structure.

DEFAULT

Driver Interface Required; Platform Needed to Bring Height to Driver Access

If the driver's platform is higher than 12 in., then the farebox is to be mounted on a platform of suitable height to provide accessibility for the driver without compromising passengers' access.

ALTERNATIVE

Stanchions

Stanchions shall be located around the farebox.

TS 24.4 Rear Step Area to Rear Area (Transit Coach)

If the vehicle is of a bi-level floor design, then a rear step area shall be provided along the center aisle of the bus to facilitate passenger traffic between the upper and lower floor levels. This step area shall be cut into the rear platform and shall be approximately the aisle width, a minimum 12 in. deep and approximately half the height of the upper level relative to the lower level. The horizontal surface of this platform shall be covered with skid-resistant material with a visually contrasting nosing and shall be sloped slightly for drainage. A warning decal or sign shall be provided at the immediate platform area to alert passengers to the change in floor level.

TS 25 Wheel Housing

TS 25.1 Design and Construction

Sufficient clearance and air circulation shall be provided around the tires, wheels and brakes to preclude overheating when the bus is operating on the design operating profile. Wheel housings shall be constructed of corrosion-resistant and fire-resistant material.

Wheel housings, as installed and trimmed, shall withstand impacts of a 2in. steel ball with at least 200 ft-lbs of energy without penetration.

TS 25.2 Design and Construction (Transit Coach)

Interference between the tires and any portion of the bus shall not be possible in maneuvers up to the limit of tire adhesion with weights from curb weight to GVWR. Wheel housings shall be adequately reinforced where seat pedestals are installed. Wheel housings shall have sufficient sound insulation to minimize tire and road noise and meet all noise requirements of this specification.

Design and construction of front wheel housings shall allow for the installation of a radio or electronic equipment storage compartment on the interior top surface, or its use as a luggage rack.

The finish of the front wheel housings shall be scratch-resistant and complement interior finishes of the bus to minimize the visual impact of the wheel housing. If fiberglass wheel housings are provided, then they shall be color-impregnated to match interior finishes. The lower portion extending to approximately 10 to 12 in. above the floor shall be equipped with scuff-resistant coating or stainless steel trim.

Wheel housings not equipped with seats or equipment enclosure shall have a horizontal assist mounted on the top portion of the housing no more than 4 in. higher than the wheel well housing.

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TS 26. Suspension

TS 26.1 General Requirements

The front, rear and mid (if articulated) suspensions shall be pneumatic type. The basic suspension system shall last the service life of the bus without major overhaul or replacement. Adjustment points shall be minimized and shall not be subject to a loss of adjustment in service. Routine adjustments shall be easily accomplished by limiting the removal or disconnecting the components.

TS 26.2 Alignment

All axles should be properly aligned so the vehicle tracks accurately within the size and geometry of the vehicle.

TS 26.3 Springs and Shock Absorbers

All shock absorbers will be heavy-duty type

TS 26.4 Suspension Travel

The suspension system shall permit a minimum wheel travel of 2.75 in. jounce-upward travel of a wheel when the bus hits a bump (higher than street surface), and 2.75 in. rebound-downward travel when the bus comes off a bump and the wheels fall relative to the body. Elastomeric bumpers shall be provided at the limit of jounce travel. Rebound travel may be limited by elastomeric bumpers or hydraulically within the shock absorbers. Suspensions shall incorporate appropriate devices for automatic height control so that regardless of load the bus height relative to the centerline of the wheels does not change more than ½ in. at any point from the height required. The safe operation of a bus cannot be impacted by ride height up to 1 in. from design normal ride height.

TS 26.5 Damping

Vertical damping of the suspension system shall be accomplished by hydraulic shock absorbers mounted to the suspension arms or axles and attached to an appropriate location on the chassis. Damping shall be sufficient to control coach motion to three cycles or less after hitting road perturbations. The shock absorber bushing shall be made of elastomeric material that will last the life of the shock absorber. The damper shall incorporate a secondary hydraulic rebound stop.

TS 26.6 Lubrication

DEFAULT

Standard Grease Fittings

All elements of steering, suspension and drive systems requiring scheduled lubrication shall be provided with grease fittings conforming to SAE Standard J534.These fittings shall be located for ease of inspection and shall be accessible with a standard grease gun from a pit or with the bus on a hoist. Each element requiring lubrication shall have its own grease fitting with a relief path. The

lubricant specified shall be standard for all elements on the bus serviced by standard fittings and shall be required no less than every 6000 miles.

TS 26.7 Kneeling

DEFAULT

A kneeling system shall lower the entrance(s) of the bus a minimum of 2 in. during loading or unloading operations regardless of load up to GVWR, measured at the longitudinal centerline of the entrance door(s) by the driver. The kneeling control shall provide the following functions:

- Downward control must be held to allow downward kneeling movement.
- Release of the control during downward movement must completely stop the lowering motion and hold the height of the bus at that position.
- Upward control actuation must allow the bus to return to normal floor height without the driver having to hold the control.

The brake and throttle interlock shall prevent movement when the bus is kneeled. The kneeling control shall be disabled when the bus is in motion. The bus shall kneel at a maximum rate of 1.25 in. per second at essentially a constant rate. After kneeling, the bus shall rise within 4 seconds to a height permitting the bus to resume service and shall rise to the correct operating height within 7 seconds regardless of load up to GVWR. During the lowering and raising operation, the maximum vertical acceleration shall not exceed 0.2g, and the sudden change in trajectory shall not exceed 0.3g/second.

An indicator visible to the driver shall be illuminated until the bus is raised to a height adequate for safe street travel. An audible warning alarm will sound simultaneously with the operation of the kneeler to alert passengers and bystanders. A warning light mounted near the curbside of the front door, a minimum 2.5 in. diameter amber lens, shall be provided that will blink when the kneel feature is activated. Kneeling shall not be operational while the wheelchair ramp is deployed or in operation.

TS 27 Wheels and Tires

TS 27.1 Wheels

All wheels shall be interchangeable. Wheels shall be compatible with tires in size and load-carrying capacity. Front wheels and tires shall be balanced as an assembly per SAE J1986.

DEFAULT

Wheels shall be Aluminum

Wheels shall be aluminum hub-piloted. Alcoa Full Polished, without Dura-Bright & without Dura Flange wear Protection – No Optional Treatment,---Full Polished. One spare wheel with tire shall be furnished with each vehicle. Wheels and tires shall be interchangeable for all position.

DEFAULT
No tire-pressure monitoring system.

DEFAULT
Standard non-locking lug nut.

TS 27.2 Tires

Tires shall be suitable for the conditions of transit service and sustained operation at the maximum speed capability of the busload on any tire at GVWR shall not exceed the tire supplier's rating.

Sufficient space shall be provided to allow the Agency to carry a spare tire, if required.

The tires will be shipped to the manufacturer direct from Goodyear by order of the agencies contract with Goodyear. This will be in advance of actual production start. Bidders are to supply the name and phone number of their contact individual for coordination with Goodyear.

TS 28 Steering

DEFAULT
Hydraulically assisted or electronic steering shall be provided.

TS 28.1 Steering Axle (Transit Coach)

DEFAULT
Solid Beam Axle and Grease-Type Front Bearings and Seals
The front axle shall be a **Meritor** solid beam, non-driving with a load rating sufficient for the bus loaded to GVWR and shall be equipped with grease type front wheel bearings and seals.

All friction points on the front axle shall be equipped with replaceable bushings or inserts and, if needed, lubrication fittings easily accessible from a pit or hoist.

The steering geometry of the outside (front lock) wheel shall be within 2 deg of true Ackerman up to 50 percent lock measured at the inside (back lock) wheel. The steering geometry shall be within 3 deg of true Ackerman for the remaining 100 percent lock measured at the inside (back lock) wheel.

TS 28.2 Steering Wheel

TS 28.2.1 Turning Effort

Steering effort shall be measured with the bus at GVWR, stopped with the brakes released and the vehicle at normal idling conditions on clean, dry, level, commercial asphalt pavement and the tires inflated to recommended pressure.

Under these conditions, the torque required to turn the steering wheel 10 deg shall be no less than 5 ft-lbs and no more than 10 ft-lbs. Steering torque may increase to 70 ft-lbs when the wheels are approaching the steering stops, as the relief valve activates.

Power steering failure shall not result in loss of steering control. With the bus in operation, the steering effort shall not exceed 55 lbs at the steering wheel rim, and perceived free play in the steering system shall not materially increase as a result of power assist failure. Gearing shall require no more than seven turns of the steering wheel lock-to-lock.

Caster angle shall be selected to provide a tendency for the return of the front wheels to the straight position with minimal assistance from the driver.

TS 28.2.2 Steering Wheel, General

The steering wheel diameter shall be approximately 18 to 20 in.; the rim diameter shall be ⅞ to 1¼ in. and shaped for firm grip with comfort for long periods of time, or approved size for electric steering.

Steering wheel spokes and wheel thickness shall ensure visibility of the dashboard so that vital instrumentation is clearly visible at center neutral position (within the range of a 95th-percentile male, as described in SAE 1050a, Sections 4.2.2 and 4.2.3).Placement of steering column must be as far forward as possible, but either in line with or behind the instrument cluster.

TS 28.2.3 Steering Column Tilt

The steering column shall have full tilt capability with an adjustment range of no less than 40 deg from the vertical and easily adjustable by the driver and shall be accessible by a 5th percentile female and 95th percentile male.

TS 28.2.4 Steering Wheel Telescopic Adjustment

The steering wheel shall have full telescoping capability and have a minimum telescopic range of 2 in. and a minimum low-end adjustment of 29 in., measured from the top of the steering wheel rim in the horizontal position to the cab floor at the heel point.

TABLE 4
Steering Wheel Height[1] Relative to Angle of Slope

At Minimum Telescopic Height Adjustment (29 in.)		At Maximum Telescopic Height Adjustment (5 in.)	
Angle of Slope	**Height**	**Angle of Slope**	**Height**
0 deg	29 in.	0 deg	34 in.
15 deg	26.2 in.	15 deg	31.2 in.
25 deg	24.6 in.	25 deg	29.6 in.
35 deg	22.5 in.	35 deg	27.5 in.

1. Measured from bottom portion closest to driver.

TS 29 Drive Axle

The bus shall be installed with a **Meritor** drive axle, driven by a heavy-duty axle with a load rating sufficient for the bus loaded to GVWR. The drive axle shall have a design life to operate for not less than 300,000 miles on the design operating profile without replacement or major repairs. The lubricant drain plug shall be magnetic type. If a planetary gear design is employed, the oil level in the planetary gears shall be easily checked through the plug or sight gauge. The axle and driveshaft components shall be rated for both propulsion and retardation modes with respect to duty cycle.

NOTE: The retardation duty cycle can be more aggressive than propulsion.

The drive shaft shall be guarded to prevent hitting any critical systems, including brake lines, coach floor or the ground, in the event of a tube or universal joint failure.

TS 29.1 Non-Drive Axle

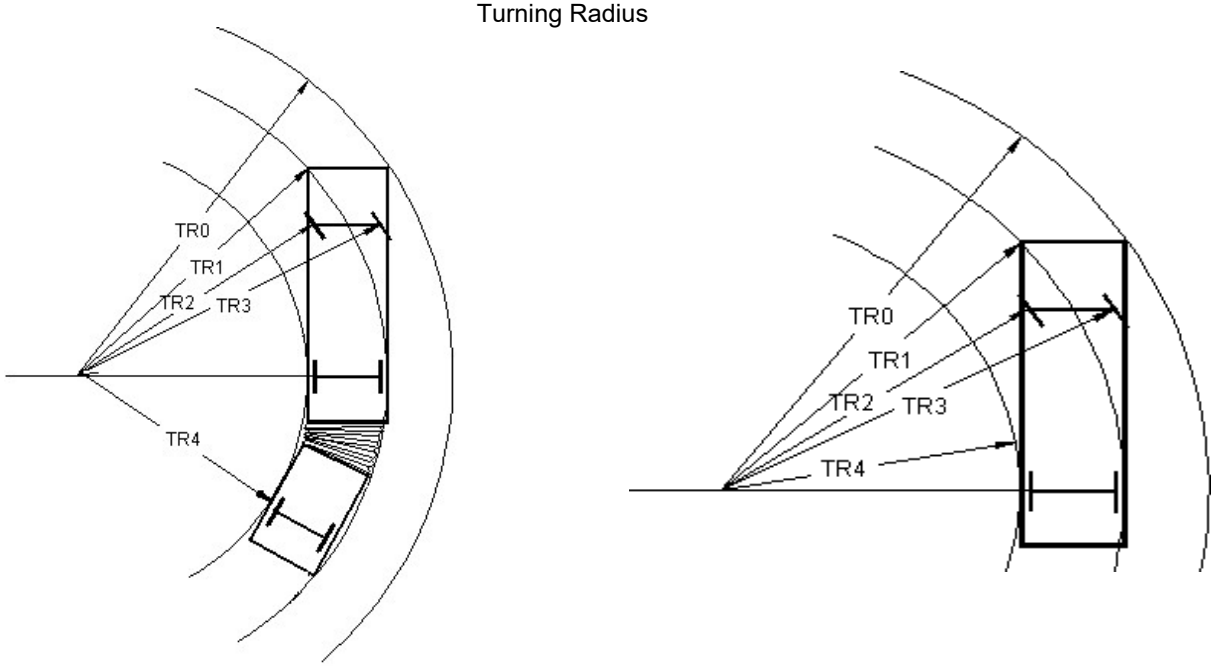
The non-drive axle is the drive axle without the drive gear with a load rating sufficient for the load to GVWR.

TS 30 Turning Radius

TABLE 5
Maximum Turning Radius

Bus Length (approximate)	Maximum Turning Radius (see Figure 3)	Agency Requirement
30 ft	31 ft (TR0)	
35 ft	39 ft (TR0)	
40 ft	44 ft (TR0)	
45 ft	49 ft (TR0)	
60 ft	44.5ft (outside front axle, TR0) 17 ft (inside rearmost axle, TR4)	

FIGURE 3
Turning Radius



TS 31 Brakes

TS 31.1 Service Brake

DEFAULT
Brakes shall be self-adjusting. Brake wear indicators (visible brake sensors) shall be provided on exposed push rods.

TS 31.2 Actuation

DEFAULT

Service brakes shall be controlled and actuated by a compressed air system. Force to activate the brake pedal control shall be an essentially linear function of the bus deceleration rate and shall not exceed 75 lbs. at a point 7 in. above the heel point of the pedal to achieve maximum braking. The heel point is the location of the driver's heel when his or her foot is rested flat on the pedal and the heel is touching the floor or heel pad of the pedal. The ECU for the ABS system shall be protected, yet in an accessible location to allow for ease of service.

The total braking effort shall be distributed among all wheels in such a ratio as to ensure equal friction material wear rate at all wheel locations. Manufacturer shall demonstrate compliance by providing a copy of a thermodynamic brake balance test upon request.

TS 31.3 Friction Material

The brake linings shall be made of non-asbestos material. In order to aid maintenance personnel in determining extent of wear, a provision such as a scribe line or a chamfer indicating the thickness at which replacement becomes necessary shall be provided on each brake lining. The complete brake lining wear indicator shall be clearly visible from the hoist or pit without removing backing plates.

DEFAULT

No remote brake wear indicator shall be required.

TS 31.4 Hubs and Drums/Discs

Replaceable wheel bearing seals shall run on replaceable wear surfaces or be of an integral wear surface sealed design. Wheel bearing and hub seals and unitized hub assemblies shall not leak or weep lubricant when operating on the design operating profile for the duration of the initial manufacturer's warranty.

ALTERNATIVE

Disc Brakes on All Axles

The bus shall be equipped with disc brakes on all axles, and the brake discs shall allow machining of each side of the disc to obtain smooth surfaces per manufacturer's specifications.

The brake system material and design shall be selected to absorb and dissipate heat quickly so that the heat generated during braking operation does not glaze the brake linings.

TS 31.5 Parking/Emergency Brake

DEFAULT

Air Brakes

The parking brake shall be a spring-operated system, actuated by a valve that exhausts compressed air to apply the brakes. The parking brake may be manually enabled when the air pressure is at the operating level per FMVSS 121.

ALTERNATIVE

Emergency Brake

An emergency brake release shall be provided to release the brakes in the event of automatic emergency brake application. The driver shall be able to manually depress and hold down the emergency brake release valve to release the brakes and maneuver the bus to safety. Once the driver releases the emergency brake release valve, the brakes shall engage to hold the bus in place. Air to the emergency brake release system shall be provided by a dedicated emergency air tank.

TS 32 Interlocks (Transit Coach)

TS 32.1 Passenger Door Interlocks

To prevent opening front and rear passenger doors while the bus is in motion, a speed sensor shall be integrated with the door controls to prevent the doors from being enabled or opened unless the bus speed is less than 2 mph.

To preclude movement of the bus, an accelerator interlock shall lock the accelerator in the closed position, and a brake interlock shall engage the service brake system to stop movement of the bus when the driver's door control is moved to a door enable or open position, or a door panel is opened more than 3 in. from the fully closed position (as measured at the leading edge of the door panel).The interlock engagement shall bring the bus to a smooth stop and shall be capable of holding a fully loaded bus on a 6 percent grade, with the engine at idle and the transmission in gear, until the interlocks are released. These interlock functions shall be active whenever the vehicle master run switch is in any run position.

All door systems employing brake and accelerator interlocks shall be supplied with supporting failure mode effects analysis (FEMA) documentation, which demonstrates that failure modes are of a failsafe type, thereby never allowing the possibility of release of interlock while an interlocked door is in an unsecured condition, unless the door master switch has been actuated to intentionally release the interlocks.

The ramp shall not be capable of operation until the vehicle brake interlock is on and the doors are in the fully open position. A system shall be installed which prevents movement of the vehicle when the ramp is extended. The system should apply the rear brakes and prevent throttle operation when the ramp is not in the stowed position.

ALTERNATIVE

Braking effort adjustable with hand tools.

TS 33 Pneumatic System

TS 33.1 General

The bus air system shall operate the air-powered accessories and the braking system with reserve capacity. New buses shall not leak down more than 5psi over a 15-minute period of time as indicated on the dash gauge.

Provision shall be made to apply shop air to the bus air systems. A quick disconnect fitting shall be easily accessible and located in the engine compartment and near the front bumper area for towing. Retained caps shall be installed to protect fitting against dirt and moisture when not in use. Air for the compressor shall be filtered. The air system shall be protected per FMVSS 121.

TS 33.2 Air Compressor

DEFAULT

The air compressor shall be sized to charge the air system from 40psi to the governor cut-off pressure in less than 4 minutes.

TS 33.3 Air Lines and Fittings

Air lines, except necessary flexible lines, shall conform to the installation and material requirements of SAE Standard J1149 for copper tubing with standard, brass, flared or ball sleeve fittings, or SAE Standard J844 for nylon tubing if not subject to temperatures over 200 °F. The air on the delivery side of the compressor where it enters nylon housing shall not be above the maximum limits as stated in SAE J844. Nylon tubing shall be installed in accordance with the following color-coding standards:

DEFAULT

- **Green:** Indicates primary brakes and supply.
- **Red:** Indicates secondary brakes.
- **Brown:** Indicates parking brake.
- **Yellow:** Indicates compressor governor signal.
- **Black:** Indicates accessories.

Line supports shall prevent movement, flexing, tension, strain and vibration. Copper lines shall be supported to prevent the lines from touching one another or any component of the bus. To the extent practicable and before installation, the lines shall be pre-bent on a fixture that prevents tube flattening or excessive local strain. Copper lines shall be bent only once at any point, including pre-bending and installation. Rigid lines shall be supported at no more than 5ft intervals. Nylon lines may be grouped and shall be supported at 30 in. intervals or less.

The compressor discharge line between power plant and body-mounted equipment shall be flexible convoluted copper or stainless steel line, or may be flexible Teflon hose with a braided stainless steel jacket. Other lines necessary to maintain system reliability shall be flexible Teflon hose with a braided stainless steel jacket. End fittings shall be standard SAE or JIC brass or steel, flanged, swivel-type fittings. Flexible hoses shall be as short as practicable and individually supported. They shall not touch one another or any part of the bus except for the supporting grommets. Flexible lines shall be supported at 2ft intervals or less.

Air lines shall be clean before installation and shall be installed to minimize air leaks. All air lines shall be routed to prevent water traps to the extent possible. Grommets or insulated clamps shall protect the air lines at all points where they pass through understructure components.

TS 33.4 Air Reservoirs

All air reservoirs shall meet the requirements of FMVSS Standard 121 and SAE Standard J10 and shall be equipped with drain plugs and guarded or flush type drain valves. Major structural members shall protect these valves and any automatic moisture ejector valves from road hazards. Reservoirs shall be sloped toward the drain valve. All air reservoirs shall have drain valves that discharge below floor level with lines routed to eliminate the possibility of water traps and/or freezing in the drain line.

TS 33.5 Air System Dryer

An air dryer shall prevent accumulation of moisture and oil in the air system. The air dryer system shall include one or more replaceable desiccant cartridges.

ALTERNATIVE

Requirement for Additional Oil Separator Provision

A provision shall be included to collect/remove oil from the air system to prevent affecting function and/or damaging pneumatic system components. A "Sludgebreaker" air dryer, Grahm & White QBA-60, with heater shall be installed in the air system.

ELECTRICAL, ELECTRONIC AND DATA COMMUNICATION SYSTEMS

TS 34 Electronic and Data Systems Overview

The electrical system will consist of vehicle battery systems and components that generate distribute and store power throughout the vehicle. (e.g., generator, voltage regulator, wiring, relays and connectors).

Electronic devices are individual systems and components that process and store data, integrate electronic information or perform other specific functions.

The data communication system consists of the bi-directional communications networks that electronic devices use to share data with other electronic devices and systems. Communication networks are essential to integrating electronic functions, both onboard the vehicle and off.

Information level systems that require vehicle information for their operations or provide information shall adhere to J1939 data standard.

Data communications systems are divided into three levels to reflect the use of multiple data networks:

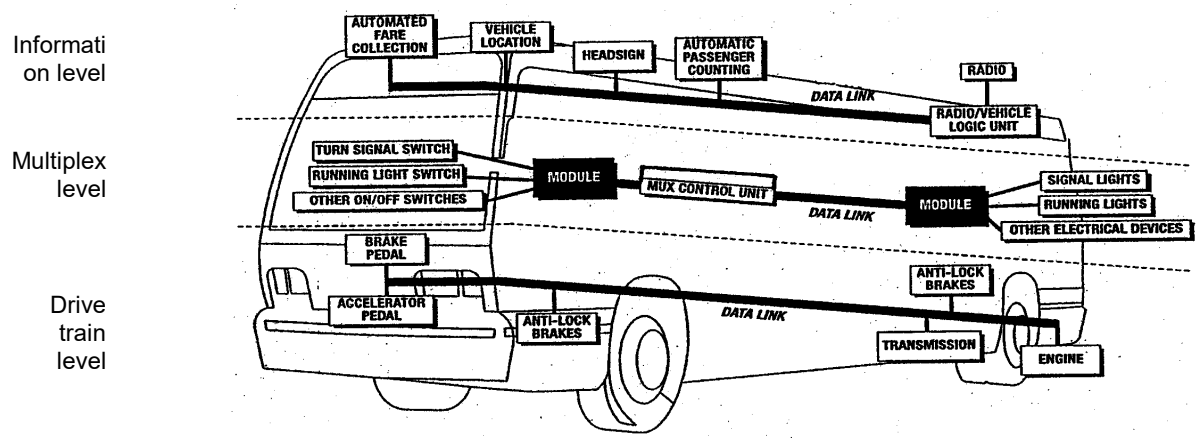
- **Power train level:** Components related to the power train, including the propulsion system components (engine, transmission and hybrid units) and anti-lock braking system (ABS),which may include traction control. At a minimum, power train components consisting of the engine, transmission, retarder, ASR and anti-lock braking systems shall

be powered by a dedicated and isolated ignition supply voltage to ensure data communication between components exists when the vehicle ignition is switched to the "on" position.

- **Information level:** Components whose primary function is the collection, control or display of data that is not necessary to the safe drivability of the vehicle (i.e., the vehicle will continue to operate when those functions are inoperable).These components typically consist of those required for automatic vehicle location (AVL) systems, destination signs, fareboxes, passenger counters, radio systems, automated voice and signage systems, video surveillance and similar components.
- **Multiplex level:** Electrical or electronic devices controlled through input/output signals such as discrete, analog and serial data information (i.e.,on/off switch inputs, relay or relay control outputs). Multiplexing is used to control components not typically found on the drive train or information levels, such as lights; wheelchair lifts; doors; heating, ventilation and air conditioning (HVAC) systems (if applicable); and gateway devices.

FIGURE 4

Data Communications Systems Levels



TS 34.1 Modular Design

Design of the electrical, electronic and data communication system shall be modular so that each electronic device, apparatus panel, or wiring bundle is easily separable from its interconnect by means of connectors.

Power plant wiring shall be an independent wiring harness. Replacement of the engine compartment wiring harness(es) shall not require pulling wires through any bulkhead or removing any terminals from the wires.

TS 35 Environmental and Mounting Requirements

The electrical system and its electronic components shall be capable of operating in the area of the vehicle in which they will be installed, as recommended in SAE J1455.

Electrical and electronic equipment shall not be located in an environment that will reduce the performance or shorten the life of the component or electrical system when operating within the design operating profile. As a recommendation, no vehicle component shall generate, or be affected by, electromagnetic interference or radio-frequency interference (EMI/RFI) that can

disturb the performance of electrical/electronic equipment as defined in SAEJ1113 and UNECE Council Directive 95/54(R10).

The Agency shall follow recommendations from bus manufacturers and subsystem suppliers regarding methods to prevent damage from voltage spikes generated from welding, jumpstarts, shorts, etc.

TS 35.1 Hardware Mounting

The mounting of the hardware shall not be used to provide the sole source ground, and all hardware shall be isolated from potential EMI/RFI, as referenced in SAE J1113.

All electrical/electronic hardware mounted in the interior of the vehicle shall be inaccessible to passengers and hidden from view unless intended to be viewed. The hardware shall be mounted in such a manner as to protect it from splash or spray.

All electrical/electronic hardware mounted on the exterior of the vehicle that is not designed to be installed in an exposed environment shall be mounted in a sealed enclosure.

All electrical/electronic hardware and its mounting shall comply with the shock and vibration requirements of SAE J1455.

TS 36 General Electrical Requirements

TS 36.1 Batteries

TS 36.1.1 Low-Voltage Batteries (24V)

The system shall supply a nominal 12V and/or 24V of direct current (DC). Batteries, except those used for auxiliary power, shall be easily accessible for inspection and service from the outside of the vehicle only. Two (2) Group 31 Series deep cycling maintenance free battery units shall be provided. Each battery shall have a minimum of 700 cold cranking amps. Each battery shall have a purchase date no more than one year from date of release for shipment to the customer.

TS 36.2 Main supply Batteries:

The batteries must be of the most current design and technology, Lithium Ion Iron Phosphate and specifically designed for vehicle propulsion. The battery management system must control state of charge, voltage, cell to cell balance and temperatures on a cell to cell level and provide diagnostic output on the same cell to cell level. The diagnostic output must be made available both via a PC communication mode as well as an LCD display at the driver's area when placed in a diagnostic mode. The batteries must be able to charge to full charge state during a six hour period using 480 volt 100 AMP service and when fully charged the vehicle shall provide a 125 mile range minimum with full passenger load and continuous Air Conditioner load.

TS 36.1.2.1 Battery Cables

The battery terminal ends and cable ends shall be color-coded with red for the primary positive, black for negative and another color for any intermediate voltage cables. Positive and negative battery cables shall not cross each other if at all possible, shall be flexible and shall be sufficiently long to reach the batteries with the tray in the extended position without stretching or pulling on any connection and shall not lie directly on top of the batteries. Except as interrupted by the master battery switch, & battery, wiring shall be continuous cables with connections secured by bolted terminals and shall conform to specification requirements of SAE Standard J1127–Type

SGR, SGT, SGX or GXL and SAE Recommended Practice J541,with 2100 strand 4/0 cable or greater recommended.

A jump-start connector, red for 24V and blue for 12V, shall be provided in the engine compartment, equipped with dust cap and adequately protected from moisture, dirt and debris.

TS 36.1.3 Battery Compartment

The battery compartment shall prevent accumulation of snow, ice and debris on top of the batteries and shall be vented and self-draining. It shall be accessible only from the outside of the vehicle. All components within the battery compartment, and the compartment itself, shall be protected from damage or corrosion from the electrolyte. The inside surface of the battery compartment's access door shall be electrically insulated, as required, to prevent the battery terminals from shorting on the door if the door is damaged in an accident or if a battery comes loose. The battery compartment temperature should not exceed manufacturer's specification.

The vehicle shall be equipped with a12VDC and 24VDC quick disconnect switch(s). The battery compartment door shall conveniently accommodate operation of the12VDC and 24VDC quick disconnect switch(s).

The battery quick disconnect access door shall be identified with a decal. The decal size shall not be less than 3.5 × 5in. (8.89 × 12.7cm).

The battery hold-down bracket shall be constructed of a nonconductive and corrosion-resistant material (plastic or fiberglass).

This access door shall not require any special locking devices to gain access to the switch, and it shall be accessible without removing or lifting the panel. The door shall be flush-fitting and incorporate a spring tensioner or equal to retain the door in a closed position when not in use. System shall be programmed so that the vehicle cannot be started if fuel door is OPEN, park brake is OFF, and operator is not in driver's seat. Alarm shall sound if operator leaves seat without setting the parking brake. In rear-run position, operator seat switch shall be bypassed.

The batteries shall be securely mounted on a stainless steel or equivalent tray that can accommodate the size and weight of the batteries. The battery tray, if applicable, shall pull out easily and properly support the batteries while they are being serviced. The tray shall allow each battery cell to be easily serviced. A locking device shall retain the battery tray to the stowed position.

If not located in the engine compartment, the same fire-resistant properties must apply to the battery compartment. No sparking devices should be located within the battery box.

TS 36.1.4 Auxiliary Electronic Power Supply

On Board Charger

a. The propulsion system shall be supplied with an onboard charging system as an integral part of the drive system. The charging system shall be capable of providing a full charge in six hours using a 480 volt 100 AMP service. In no event will additional infrastructure modifications beyond the 480 volt 100 AMP service be required and no additional expenses for

charging stations, charging infrastructure, en-route charging or disruption or modifications to FWTA's existing routes be required for the operation of the bus. The contractors' technical proposal shall clearly address and define the buses charging system and process and confirm that all needed charging equipment is integrated with the drive system and included in the contractors quoted price per bus INCLUDING INSTALLATION ON DEFINED ROUTES.

Inductive Charger

a. An Inductive charger is to be installed on vehicles, providing alternative wireless charging capabilities.

Workmanship

a. All new wiring will be properly marked with a unique identifier every 12 inches. Markings will be chemical and heat resistant and suitable for operations in harsh environments.

b. All wiring will be properly loomed and routed to avoid chaffing, pinching and damage from proximity to excessive temperatures.

c. Terminations will be soldered and crimped using properly insulated materials. In all cases all wiring and all other workmanship will be done to best industry practices.

TS 36.1.5 Master Battery Switch

The location of the master battery switch shall be clearly identified on the exterior access panel, be accessible in less than 10 seconds for deactivation and prevent corrosion from fumes and battery acid when the batteries are washed off or are in normal service.

Turning the master switch off with the power plant operating, during an emergency, shall shut off the engine and shall not damage any component of the electrical system. The master switch shall be capable of carrying and interrupting the total circuit load.

DEFAULT

Single Switch

The batteries shall be equipped with a single switch for disconnecting both12V and 24Vpower.

TS 36.1.6 Low-Voltage Generation and Distribution

The Propulsion System Batteries shall maintain the charge on the low voltage batteries.

The vehicle shall be equipped with a 300-AMP minimum, 24 VDC DC-DC power converter, suitably rated to handle the electrical load requirements. The high output DC amps shall be achieved at the DC-DC Power converter's designed maximum output.

Power distribution shall be accomplished by means of conductive bus-bars, terminal strips, or stud-terminal blocks that are sized for the cumulative total current of connected branch circuits and for the physical securement of them. One such arrangement is to exist for each voltage potential level and ground. These points to all equipment requiring dedicated power and ground wiring to the batteries shall be accomplished by using power bus bars consisting of either a solid copper bar or heavy-duty terminal strip. One bus bar for each voltage potential, including ground, shall be located as close, electrically speaking, to the source of the potential (the battery source) as physically practical, based on recommendations of the vehicle manufacturer. Terminal stack-up is not to exceed a quantity of four (4) per each individual screw, post, or stud block. All cabling and wiring associated with an individual circuit will be sized to ensure a voltage drop figure of no more than 5% of the source voltage. This figure is to cover the total loop from source potential to source ground.

TS 36.1.7 Circuit Protection

All branch circuits, except battery-to-starting motor and battery-to-generator/alternator circuits, shall be protected by current-limiting devices such as circuit breakers, fuses or solid-state devices sized to the requirements of the circuit. Electronic circuit protection for the cranking motor shall be provided to prevent engaging of the motor for more than 30 seconds at a time to prevent overheating. The circuit breakers or fuses shall be easily accessible for authorized personnel. Fuses shall be used only where it can be demonstrated that circuit breakers are not practicable. This requirement applies to in-line fuses supplied by either the Contractor or a supplier. Fuse holders shall be constructed to be rugged and waterproof. All manual reset circuit breakers critical to the operation of the bus shall be mounted in a location convenient to the Agency mechanic with visible indication of open circuits. The Agency shall consider the application of automatic reset circuit breakers on a case-by-case basis. The Contractor shall show all in-line fuses in the final harness drawings. Any manually resettable circuit breakers shall provide a visible indication of open circuits. Any manually resettable circuit breakers shall provide a visible indication of open circuits.

Circuit breakers or fuses shall be sized to a minimum of 15 percent larger than the total circuit load. The current rating for the wire used for each circuit must exceed the size of the circuit protection being used.

TS 36.2 Grounds

The battery shall be grounded to the vehicle chassis/frame at one location only, as close to the batteries as possible. When using a chassis ground system, the chassis shall be grounded to the frame in multiple locations, evenly distributed throughout the vehicle to eliminate ground loops. No more than five ground ring/spade terminal connections shall be made per ground stud with spacing between studs ensuring contactivity and serviceability. Electronic equipment requiring an isolated ground to the battery (i.e., electronic ground) shall not be grounded through the chassis.

TS 36.2.1 Low Voltage/Low Current Wiring and Terminals

All power and ground wiring shall conform to specification requirements of SAE Recommended Practice J1127, J1128 and J1292. Double insulation shall be maintained as close to the junction box, electrical compartment or terminals as possible. The requirement for double insulation shall be met by wrapping the harness with plastic electrical tape or by sheathing all wires and harnesses with non-conductive, rigid or flexible conduit.

Wiring shall be grouped, numbered and/or color-coded. Wiring harnesses shall not contain wires of different voltage classes unless all wires within the harness are insulated for the highest voltage present in the harness. Kinking, grounding at multiple points, stretching, and exceeding minimum bend radius shall be prevented.

Strain-relief fittings shall be provided at all points where wiring enters electrical compartments. Grommets or other protective material shall be installed at points where wiring penetrates metal structures outside of electrical enclosures. Wiring supports shall be protective and non-conductive at areas of wire contact and shall not be damaged by heat, water, solvents or chafing.

To the extent practicable, wiring shall not be located in environmentally exposed locations under the vehicle. Wiring and electrical equipment necessarily located under the vehicle shall be insulated from water, heat, corrosion and mechanical damage. Where feasible, front-to-rear electrical harnesses shall be installed above the window line of the vehicle.

All wiring harnesses over 5 ft. long and containing at least five wires shall include 10 percent (minimum one wire) excess wires for spares. This requirement for spare wires does not apply to data links and communication cables. Wiring harness length shall allow end terminals to be replaced twice without pulling, stretching or replacing the wire. Terminals shall be crimped to the wiring according to the connector manufacturer's recommendations for techniques and tools. All cable connectors shall be locking type, keyed and sealed, unless enclosed in water tight cabinets or vehicle interior. Pins shall be removable, crimp contact type, of the correct size and rating for the wire being terminated. Unused pin positions shall be sealed with sealing plugs. Adjacent connectors shall use either different inserts or different insert orientations to prevent incorrect connections.

Terminals shall be crimped, corrosion-resistant and full ring type or interlocking lugs with insulating ferrules. When using pressure type screw terminal strips, only stranded wire shall be used. Insulation clearance shall ensure that wires have a minimum of "visible clearance" and a maximum of two times the conductor diameter or 1/16 in., which - ever is less. When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands that can penetrate the insulation of the inner wires.

Ultra-sonic and T-splices may be used with 8AWG or smaller wire. When a T-splice is used, it shall meet these additional requirements:

- It shall include a mechanical clamp in addition to solder on the splice.
- The wire shall support no mechanical load in the area of the splice.
- The wire shall be supported to prevent flexing.

All splicing shall be staggered in the harness so that no two splices are positioned in the same location within the harness.

Wiring located in the engine compartment shall be routed away from high-heat sources or shielded and/or insulated from temperatures exceeding the wiring and connector operating requirements.

The instrument panel and wiring shall be easily accessible for service from the driver's seat or top of the panel. The instrument panel shall be separately removable and replaceable without damaging the instrument panel or gauges. Wiring shall have sufficient length and be routed to permit service without stretching or chafing the wires.

TS 36.2.2 Electrical Components

All electrical components, including switches, relays, flashers and circuit breakers, shall be heavy-duty designs with either a successful history of application in heavy-duty vehicles or design specifications for an equivalent environment.

All electric motors shall be heavy-duty brushless type where practical, and have a continuous duty rating of no less than 40,000 hours (except cranking motors, washer pumps, auxiliary heater pumps, defroster and wiper motors).All electric motors shall be easily accessible for servicing.

TS 36.2.3 Electrical Compartments

All relays, controllers, flashers, circuit breakers and other electrical components shall be mounted in easily accessible electrical compartments. All compartments exposed to the outside environment shall be corrosion-resistant and sealed. The components and their functions in each electrical compartment shall be identified and their location permanently recorded on a drawing attached to the inside of the access panel or door. The drawing shall be protected from oil, grease, fuel and abrasion.

The front compartment shall be completely service able from the driver's seat, vestibule or from the outside. "Rear start and run" controls shall be mounted in an accessible location in the engine compartment and shall be protected from the environment.

TS 37 General Electronic Requirements

If an electronic component has an internal real-time clock, it shall provide its own battery backup to monitor time when battery power is disconnected, and/or it may be updated by a network component. If an electronic component has an hour meter, it shall record accumulated service time without relying on battery backup.

All electronic component suppliers shall ensure that their equipment is self-protecting in the event of shorts in the cabling, and also in over-voltage (over 32V DC on a 24V DC nominal voltage rating with a maximum of 50V DC) and reverse polarity conditions. If an electronic component is required to interface with other components, it shall not require external pull-up and/or pull-down resistors. Where this is not possible, the use of a pull-up or pull-down resistor shall be limited as much as possible and easily accessible and labeled.

TS 37.1 Wiring and Terminals

Kinking, grounding at multiple points, stretching and reducing the bend radius below the manufacturer's recommended minimum shall not be permitted.

TS 37.2 Discrete I/O (Inputs/Outputs)

All wiring to I/O devices, either at the harness level or individual wires, shall be labeled, stamped or color-coded in a fashion that allows unique identification at a spacing not exceeding 4 in. Wiring for each I/O device shall be bundled together. If the I/O terminals are the same voltages, then jumpers may be used to connect the common nodes of each I/O terminal.

TS 37.3 Shielding

All wiring that requires shielding shall meet the following minimum requirements. A shield shall be generated by connecting to a ground, which is sourced from a power distribution bus bar or chassis. A shield shall be connected at one location only, typically at one end of the cable.

However, certain standards or special requirements, such as SAE J1939 or RF applications, have separate shielding techniques that also shall be used as applicable.

> **NOTE: A shield grounded at both end forms a ground loop, which can cause intermittent control or faults.**

When using shielded or coaxial cable, upon stripping of the insulation, the metallic braid shall be free from frayed strands, which can penetrate the insulation of the inner wires. To prevent the introduction of noise, the shield shall not be connected to the common side of a logic circuit.

TS 37.4 Communications

The data network cabling shall be selected and installed according to the selected protocol requirements. The physical layer of all network communication systems shall not be used for any purpose other than communication between the system components, unless provided for in the network specifications.

Communications networks that use power line carriers (e.g., data modulated on a 24V power line) shall meet the most stringent applicable wiring and terminal specifications.

TS 37.5 Radio Frequency (RF)

RF components, such as radios, video devices, cameras, global positioning systems (GPS), etc., shall use coaxial cable to carry the signal. All RF systems require special design consideration for losses along the cable. Connectors shall be minimized, since each connector and crimp has a loss that will attribute to attenuation of the signal. Cabling should allow for the removal of antennas or attached electronics without removing the installed cable between them. If this cannot be done, then a conduit of sufficient size shall be provided for ease of attachment of antenna and cable assembly. The corresponding component vendors shall be consulted for proper application of equipment, including installation of cables.

TS 37.6 Audio

Cabling used for microphone level and line level signals shall be 18 AWG minimum with shielded twisted pair. Cabling used for amplifier level signals shall be18 AWG minimum.

TS 38 Multiplexing

TS 38.1 General

The primary purpose of the multiplexing system is control of components necessary to operate the vehicle. This is accomplished by processing information from input devices and controlling output devices through the use of an internal logic program.

Versatility and future expansion shall be provided for by expandable system architecture. The multiplex system shall be capable of accepting new inputs and outputs through the addition of new modules and/or the utilization of existing spare inputs and outputs. All like components in the multiplex system shall be modular and interchangeable with self-diagnostic capabilities. The modules shall be easily accessible for troubleshooting electrical failures and performing system maintenance. Multiplex input/output modules shall use solid-state devices to provide extended service life and individual circuit protection.

DEFAULT

Ten percent of the total number of inputs and outputs, or at least one each for each voltage type utilized (0V,12V, 24V) at each module location shall be designated as spares.

TS 38.2 System Configuration

Multiplexing may either be distributed or centralized. A distributed system shall process information on multiple control modules within the network. A centralized system shall process the information on a single control module. Either system shall consist of several modules connected to form a control network.

TS 38.2.1 I/O Signals

The input/output for the multiplex system may contain four types of electrical signals: discrete, modulating, analog or serial data.

Discrete signals shall reflect the on/off status of switches, levers, limit switches, lights, etc. Analog signals shall reflect numerical data as represented by a voltage signal (0–12V, 10–24V, etc.) or current signal (4–20 mA). Both types of analog signals shall represent the status of variable devices such as rheostats, potentiometers, temperature probes, etc. Serial data signals shall reflect ASCII or alphanumeric data used in the communication between other on-board components.

TS 39 Data Communications

TS 39.1 General

All data communication networks shall be either in accordance with a nationally recognized interface standard, such as those published by SAE, IEEE or ISO, or shall be published to the Agency with the following minimum information:

- Protocol requirements for all timing issues (bit, byte, packet, inter-packet timing, idle line timing, etc.) packet sizes, error checking and transport (bulk transfer of data to/from the device).
- Data definition requirements that ensure access to diagnostic information and performance characteristics.
- The capability and procedures for uploading new application or configuration data.
- Access to revision level of data, application software and firmware.
- The capability and procedures for uploading new firmware or application software.
- Evidence that applicable data shall be broadcast to the network in an efficient manner such that the overall network integrity is not compromised.

Any electronic vehicle components used on a network shall be conformance tested to the corresponding network standard.

TS 39.2 Drive train Level

Drive train components, consisting of the engine, transmission, retarder, anti-lock braking system and all other related components, shall be integrated and communicate fully with respect to vehicle operation with data using SAE Recommended Communications Protocols such as J1939 and/or J1708/J1587 with forward and backward compatibilities or other open protocols. At a minimum, drive train components consisting of the engine, transmission, retarder ASR, and anti-

lock braking systems shall be powered by a dedicated and isolated ignition supply voltage to ensure data communication among components exists when the vehicle ignition is switched to the "on" position.

TS 39.2.1 Diagnostics, Fault Detection and Data Access

Drive train performance, maintenance and diagnostic data, and other electronic messages shall be formatted and transmitted on the communications networks.

The drive train level shall have the ability to record abnormal events in memory and provide diagnostic codes and other information to service personnel. At a minimum, this network level shall provide live/fail status, current hardware serial number, software/data revisions and uninterrupted timing functions.

TS 39.2.2 Programmability (Software)

The drive train level components shall be programmable by the Agency with limitations as specified by the subsystem Supplier.

TS 40 Multiplex Level

TS 40.1 Data Access

At a minimum, information shall be made available via a communication port on the multiplex system. The location of the communication port shall be easily accessible. A hardware gateway and/or wireless communications system are options if requested by the Agency. The communication port(s) shall be located as specified by the Agency.

TS 40.1.1 Diagnostics and Fault Detection

The multiplex system shall have a proven method of determining its status (system health and input/output status) and detecting either active (online) or inactive (offline) faults through the use of on-board visual/audible indicators.

In addition to the indicators, the system shall employ an advanced diagnostic and fault detection system, which shall be accessible via either a personal computer or a handheld unit. Either unit shall have the ability to check logic function. The diagnostic data can be incorporated into the information level network or the central data access system.

TS 40.1.2 Programmability (Software)

The multiplex system shall have security provisions to protect its software from unwanted changes. This shall be achieved through any or all of the following procedures:

- Password protection
- Limited distribution of the configuration software
- Limited access to the programming tools required to change the software
- Hardware protection that prevents undesired changes to the software

Provisions for programming the multiplex system shall be possible through a PC or laptop. The multiplex system shall have proper revision control to ensure that the hardware and software are

identical on each vehicle equipped with the system. Revision control shall be provided by all of the following:

- Hardware component identification where labels are included on all multiplex hardware to identify components
- Hardware series identification where all multiplex hardware displays the current hardware serial number and firmware revision employed by the module
- Software revision identification where all copies of the software in service display the most recent revision number
- A method of determining which version of the software is currently in use in the multiplex system

DEFAULT

Revision control labels shall be electronic.

ALTERNATIVE

Revision control labels shall be physically located near the programming port.

TS 41 Electronic Noise Control

Electrical and electronic subsystems and components on all buses shall not emit electromagnetic radiation that will interfere with on-board systems, components or equipment, telephone service, radio or TV reception, or violate regulations of the Federal Communications Commission.

Electrical and electronic subsystems on the coaches shall not be affected by external sources of RFI/EMI. This includes, but is not limited to, radio and TV transmission, portable electronic devices including computers in the vicinity of or onboard the buses, AC or DC power lines and RFI/EMI emissions from other vehicles.

DRIVER PROVISIONS, CONTROLS AND INSTRUMENTATION

TS 42 Driver's Area Controls

TS 42.1 General

In general when designing the driver's area, it is recommended that SAE J833, "Human Physical Dimensions," be used.

Switches and controls shall be divided into basic groups and assigned to specific areas, in conformance with SAE Recommended Practice J680, Revised 1988, "Location and Operation of Instruments and Controls in Motor Truck Cabs," and be essentially within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach."

TS 42.2 Glare

The driver's work area shall be designed to minimize glare to the extent possible. Objects within and adjacent to this area shall be matte black or dark gray in color wherever possible to reduce the reflection of light onto the windshield. The use of polished metal and light-colored surfaces within and adjacent to the driver's area shall be avoided.

TS 42.3 Visors/Sun Shades

ALTERNATIVE

Driver's Window Sunscreens

An adjustable roller type sunscreen shall be provided over the driver's windshield and/or the driver's side window. The sunscreen shall be capable of being lowered to the midpoint of the driver's window. When deployed, the screen shall be secure, stable, and shall not rattle, sway or intrude into the driver's field of view due to the motion of the coach or as a result of air movement. Once lowered, the screen shall remain in the lowered position until returned to the stowed position by the driver. Sunscreen shall be shaped to minimize light leakage between the visor and windshield pillars to the extent possible.

TS 42.4 Driver's Controls

Frequently used controls must be in easily accessible locations. These include the door control, kneel control, windshield wiper/washer controls, ramp, and lift and run switch. Any switches and controls necessary for the safe operation of the bus shall be conveniently located and shall provide for ease of operation. They shall be identifiable by shape, touch and permanent markings. Controls also shall be located so that passengers may not easily tamper with control settings.

All panel-mounted switches and controls shall be marked with easily read identifiers. Graphic symbols shall conform to SAE Recommended Practice J2402, "Road Vehicles – Symbols for Controls, Indicators, and Tell Tales," where available and applicable. Color of switches and controls shall be dark with contrasting typography or symbols.

Mechanical switches and controls shall be replaceable, and the wiring at these controls shall be serviceable from a convenient location. Switches, controls and instruments shall be dust- and water-resistant.

DEFAULT

All switches/controls in the driver's controls area shall be mounted in an angled panel steep enough to discourage drivers from using it as a personal storage area for items like food, drinks, cell phones, etc.

TS 42.5 Normal Bus Operation Instrumentation and Controls

The following list identifies bus controls used to operate the bus. These controls are either frequently used or critical to the operation of the bus. They shall be located within easy reach of the operator. The operator shall not be required to stand or turn to view or actuate these controls unless specified otherwise.

Systems or components monitored by onboard diagnostics system shall be displayed in clear view of the operator and provide visual and/or audible indicators. The intensity of indicators shall permit easy determination of on/off status in bright sunlight but shall not cause a distraction or visibility problem at night. All indicators shall be illuminated using backlighting.

The indicator panel shall be located in Area 1 or Area 5, within easy view of the operator instrument panel. All indicators shall have a method of momentarily testing their operation. The audible alarm shall be tamper-resistant and shall have an outlet level between 80 and 83 dBA when measured at the location of the operator's ear.

On-board displays visible to the operator shall be limited to indicating the status of those functions described herein that are necessary for the operation of the bus. All other indicators needed for diagnostics and their related interface hardware shall be concealed and protected from unauthorized access. **Table 6** represents instruments and alarms. The intent of the overall physical layout of the indicators shall be in a logical grouping of systems and severity nature of the fault.

Consideration shall be provided for future additions of spare indicators as the capability of onboard diagnostic systems improves. Blank spaces shall contain LEDs.

TABLE 6 (Transit Coach)
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Master run switch	Rotary, four-position detent	Side console	Master control for bus, off, day run, night run and clearance ID lights	
Engine start, front	Approved momentary switch	Side console	Activates engine starter motor	
Engine start, rear	Approved momentary switch	Engine compartment	Activates engine starter motor	
Engine run, rear	Three-position toggle switch	Engine compartment	Permits running engine from rear start, normal front run position and off	Amber light
Drive selector	Touch panel switch	Side console	Provides selection of propulsion: forward, reverse and neutral	Gear selection
HVAC	Switch or switches to control HVAC	Side console	Permits selection of passenger ventilation: off, cool, heat, low fan, high fan or full auto with on/off only	
Driver's ventilation	Rotary, three-position detent	Side console or dash left wing	Permits supplemental ventilation: fan off, low or high	
Defroster fan	Rotary, three-position detent	Side console or dash left wing	Permits defroster: fan off, low, medium or high	
Defroster temperature	Variable position	Side console or dash left wing	Adjusts defroster water flow and temperature	
Windshield wiper	One-variable rotary position operating both wipers	Dash left wing	Variable speed control of left and right windshield wipers	
Windshield washer	Push button	Dash left wing	Activates windshield washers	
Dash panel lights	Rotary rheostat or stepping switch	Side console or dash left wing	Provides adjustment for light intensity in night run position	

TABLE 6 (Transit Coach)

Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Interior lights	Three-position switch	Side console	Selects mode of passenger compartment lighting: off, on, normal	
Fast idle	Not Used	Side console	Selects high idle speed of engine	
WC ramp/ kneel enable	Two-position switch[1]	Side console or dash right wing	Permits operation of ramp and kneel operations at each door remote panel	Amber light
Front door ramp/kneel enable	Two-position keyed switch[1]	Front door remote or dash right wing	Permits ramp and kneel activation from front door area, key required[1]	Amber light
Front door ramp	Three-position momentary switch	Right side of steering wheel	Permits deploy and stow of front ramp	Red light
Front kneel	Three-position momentary switch	Front door remote	Permits kneeling activation and raise and normal at front door remote location	Amber or red dash indicator; exterior alarm and amber light
Rear door ramp/kneel enable	Two-position keyed switch[1]	Rear door remote	Permits ramp and kneel activation from rear door area; key required[1]	Red light
Rear door ramp	Not Used	Rear door remote	Permits deploy and stow of rear ramp	
Rear kneel	Not Used	Rear door remote	Permits kneeling activation and raise and normal at rear door remote location	
Silent alarm	Recessed push button, NO and NC contacts momentary	Side console	Activates emergency radio alarm at dispatch and permits covert microphone and/or enables destination sign emergency message	
Video system event switch	Momentary on/off momentary switch with plastic guard	Side console	Triggers event equipment, triggers event light on dash	Amber light
Left remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of left exterior mirror	
Right remote mirror	Four-position toggle type	Side console	Permits two-axis adjustment of right exterior mirror	
Mirror heater	Switch or temperature activated	Side console	Permits heating of outside mirrors when required	
Passenger door control	Five-position handle type detent or two momentary push buttons	Side console, forward	Permits open/close control of front and rear passenger doors	Red light
Rear door override	Two-position switch in approved location	Side console, forward	Allows driver to override activation of rear door passenger tape switches	

TABLE 6 (Transit Coach)

Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Engine shutdown override	Not Used	Side console	Permits driver to override auto engine shutdown	
Hazard flashers	Two-position switch	Side console or dash right wing	Activates emergency flashers	Two green lights
Fire suppression	Red push button with protective cover	Dash left wing or dash center	Permits driver to override and manually discharge fire suppression system	Red light
Mobile data terminal	Mobile data terminal coach operator interface panel	Above right dash wing	Facilitates driver interaction with communication system and master log-on	LCD display with visual status and text messages
Farebox interface	Farebox coach operator interface panel	Near farebox	Facilitates driver interaction with farebox system	LCD display
Destination sign interface	Destination sign interface panel	In approved location	Facilitates driver interaction with destination sign system, manual entry	LCD display
Turn signals	Momentary push button (two required) raised from other switches	Left foot panel	Activates left and right turn signals	Two green lights and optional audible indicator
PA manual	Momentary push button	In approved location	Permits driver to manually activate public address microphone	
Low-profile microphone	Low-profile discrete mounting	Steering column	Permits driver to make announcements with both hands on the wheel and focusing on road conditions	
High beam	Detented push button	In approved location	Permits driver to toggle between low and high beam	Blue light
Parking brake	Pneumatic PPV	Side console or dash left wing	Permits driver to apply and release parking brake	Red light
Park brake release	Pneumatic PPV	Vertical side of the side console or dash center	Permits driver to push and hold to release brakes	
Hill holder	Not Used	Side console	Applies brakes to prevent bus from rolling	
Remote engine speed	Rotary rheostat	Engine compartment	Permits technician to raise and lower engine RPM from engine compartment	
Master door/ interlock	Multi-pole toggle, detented	Out of operator's reach	Permits driver override to disable door and brake/throttle interlock	Red light
Warning interlocks deactivated	Red indicator light	Dash panel center	Illuminates to warn driver that interlocks have been deactivated	Red light

TABLE 6 (Transit Coach)

Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Retarder disable	Multi-pole switch detented	In overhead of operator area	Permits driver override to disable brake retardation/regeneration	Red light
Alarm acknowledge	Push button momentary	Approved location	Permits driver to acknowledge alarm condition	
Rear door passenger sensor disable	Multi-pole toggle, detented	In sign compartment or driver's barrier compartment	Permits driver to override rear door passenger sensing system	
Indicator/ alarm test button	Momentary switch or programming[1]	Dash center panel	Permits driver to activate test of sentry, indicators and audible alarms	All visuals and audibles
Auxiliary power	110 V power receptacle	Approved location	Property to specify what function to supply	
Speedometer	Speedometer, odometer, and diagnostic capability, 5-mile increments	Dash center panel	Visual indication of speed and distance traveled, accumulated vehicle mileage, fault condition display	Visual
Air pressure gauge	Primary and secondary, 5 psi increments	Dash center panel	Visual indication of primary and secondary air systems	Red light and buzzer
Fire detection	Coach operator display	Property specific or dash center	Indication of fire detection activation by zone/location	Buzzer and red light
Door obstruction	Sensing of door obstruction	Dash center	Indication of rear door sensitive edge activation	Red light and buzzer
Door ajar	Door not properly closed	Property specific or dash center	Indication of rear door not properly closed	Buzzer or alarm and red light
Low system air pressure	Sensing low primary and secondary air tank pressure	Dash center	Indication of low air system pressure	Buzzer and red light
Methane detection function	Not Used	Property specific or dash center	Detects system failure	No start condition, amber light
Methane detection	Not Used	Property specific or dash center	Detects levels of methane	Flashing red at 20% LEL
Methane detection	Not Used	Property specific or dash center	Detects levels of methane	Solid red at 50% LEL
Engine coolant indicator	Not Used	Within driver's sight	Detects low coolant condition	Amber light
Hot engine indicator	Not Used	Within driver's sight	Detects hot engine condition and initiates time delay shutdown	Red light
Low engine oil pressure indicator	Not Used	Within driver's sight	Detects low engine oil pressure condition and initiates time-delayed shutdown	Red light

TABLE 6 (Transit Coach)

Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
ABS indicator	Detects system status	Dash center	Displays system failure	Amber light
HVAC indicator	Detects system status	Dash center	Displays system failure	Amber or red light
Charging system indicator (12/24 V)	Detect charging system status	Dash center	Detects no charge condition and optionally detects battery high, low, imbalance, no charge condition, and initiates time-delayed shutdown	Red light flashing or solid based on condition
Bike rack deployed indicator	Detects bike rack position	Dash center	Indication of bike rack not being in fully stowed position	Amber or red light
Fuel tank level	Not Used	Dash center	Indication of fuel tank level/pressure	
DEF gauge	Not Used	Center dash	Displays level of DEF tank and indicates with warning light when low	Red light
Active regeneration	Not Used	Dash center	Indication of electric regeneration	Amber or red light
Turntable	Not Used	Dash center	Warning indication for hinge locking	Audible and amber warning and red light if locked
Turntable	Not Used	Side console	Momentarily release interlock brakes due to over angled condition	

1. Indicate area by drawing. Break up switch control from indicator lights.

TABLE 6 (ALTERNATIVE, Transit Coach)
Transit Bus Instruments and Alarms

Device	Description	Location	Function	Visual/ Audible
Fleetwatch model JX55 GPS Mileage Tracking Module (mounted on the interior of the 1st roadside window or interior compartment near driver's area). This must have the fleet specific software in each unit designed specifically for the Trinity Metro. A traffic control emitter will be installed at the front curbside upper windshield area. Global Traffic Technologies LLC, Stock No. 76-1000-1047-0, Model No. 794T LED Emitter, Transit. This shall be wired in conjunction with the vehicles emergency flashers so that when parked at an intersection with the flashers operating the emitter is rendered ineffective on the traffic lights. ADDITIONAL INCLUSION: Child Alert System: It becomes active anytime the ignition switch is in any position other than Off. The bus will always have buzzers and lights active when the ignition is turned on and the engine is not running. There is only one switch located in the back of the bus and it is always active when the ignition is on, it will do nothing when touched with the ignition on. When the ignition is turned Off from the on position, the light bar inside the bus will beep, this serves as the driver's warning/timer to walk through to the back of the bus. If the Driver does not toggle the switch at the rear of the bus within that minute, then the Kneeling buzzer will sound until the switch is hit resetting the system. A Kirk Key Transmission lockout with Key # 21750 will be installed on the driver's side console Bus will need to be pre-wired for 9 IP Ethernet camera system and Back up camera with driver monitor, power and ground to the Radio Storage box for the NVR. Camera Layout will be provided by Trinity Metro Add Charge Guard model CG-X Havis to control both 12v & 24v battery hot Bus Bars for electronic accessories. Mounted in Radio Storage Box AVL- An automatic vehicle locator system by VONTAS shall be provided and installed with Trinity Metro ITS specific software including IRMA MATRIX: 3D sensor APC. (automatic passenger counter) ITS system with card Reader and ITS Passenger Counter Option for Satellite, & onboard WIFI, Sierra MG90 5G: 1104708 (Single 4x4), 04709 (Dual 2x2) mount in radio cabinet on its own shelf USB & 110V outlets A Infotransit system made by Luminator Technology Group, INC with a 24" monitor				

TS 42.6 Driver Foot Controls

Accelerator and brake pedals shall be designed for ankle motion. Foot surfaces of the pedals shall be faced with wear-resistant, nonskid, replaceable material.

TS 42.7 Pedal Angle

The vertical angle of the accelerator and brake pedals shall be determined from a horizontal plane regardless of the slope of the cab floor. The accelerator and brake pedals shall be positioned at an angle of 37 to 50deg at the point of initiation of contact and extend downward to an angle of 10 to 18deg at full throttle.

The location of the brake and accelerator pedals shall be determined by the manufacturer, based on space needs, visibility, lower edge of windshield and vertical H-point.

TS 42.7.1 Pedal Dimensions and Position

The floor-mounted accelerator pedal shall be 10 to 12 in. long and 3 to 4 in. wide. Clearance around the pedal must allow for no interference precluding operation.

The accelerator and brake pedals shall be positioned such that the spacing between them, measured at the heel of the pedals, is between 1 and 2 in. Both pedals should be located approximately on the same plane coincident to the surface of the pedals.

TS 42.7.2 Brake and Accelerator Pedals

ALTERNATIVE

Adjustable Brake and Accelerator Pedals

Both pedals shall be adjustable forward and rearward a minimum of 3 in. The adjustment shall be made by use of a dash-mounted toggle or rocker switch. The switch shall be clearly labeled to identify it as pedal adjustment and shall be within easy reach of the driver. Pedal adjustment shall be enabled only when the bus is stationary and the parking brake engaged.

TS 43 Driver Foot Switches

Floor-Mounted Foot Control Platform

The angle of the turn signal platform shall be determined from a horizontal plane, regardless of the slope of the cab floor. The turn signal platform shall be angled at a minimum of 10 deg and a maximum of 37 deg. It shall be located no closer to the seat front than the heel point of the accelerator pedal.

DEFAULT

Turn Signal Controls

Turn signal controls shall be floor-mounted, foot-controlled, water-resistant, heavy-duty, momentary contact switches.

ALTERNATIVE

Turn Signal Controls

Adjustable turn signal platform.

DEFAULT

Foot Switch Control

The control switches for the turn signals shall be mounted on an inclined, floor-mounted stainless steel enclosure or metal plate mounted to an incline integrated into the driver's platform, located to the left of the steering column. The location and design of this enclosure shall be such that foot room for the operator is not impeded. The inclined mounting surface shall be skid-resistant. All other signals, including high beam and public address system, shall be in approved locations.

The foot switches shall be UL-listed, heavy-duty type, of a rugged, corrosion-resistant metal construction. The foot switches for the directionals shall be momentary type, while those for the PA system and the high beam shall be latching type. The spacing of the switches shall be such that inadvertent simultaneous deflection of switches is prevented.

TS 44 Driver's Amenities

TS 44.1 Coat Hanger

ALTERNATIVE

Coat Hook

A hook and loop shall be provided to secure the driver's coat.

TS 44.2 Drink Holder

DEFAULT

No drink holder.

TS 44.3 Storage Box

DEFAULT

Storage Box

An enclosed driver storage area shall be provided with a positive latching door and/or lock. The minimum size is 2750 $in.^3$

TS 45 Windshield Wipers and Washers

TS 45.1 Windshield Wipers

The bus shall be equipped with a windshield wiper for each half of the windshield. At 60 mph, no more than 10 percent of the wiped area shall be lost due to windshield wiper lift. For two-piece windshields, both wipers shall park along the center edges of the windshield glass. For single-piece windshields, wipers shall park along the bottom edge of the windshield. Windshield wiper motors and mechanisms shall be easily accessible for repairs or service. The fastener that secures the wiper arm to the drive mechanism shall be corrosion-resistant.

DEFAULT

Single-control, electric two-speed intermittent wiper.

ALTERNATIVE

Intermittent Wiper with Variable Control

A variable-speed feature shall be provided to allow adjustment of wiper speed for each side of the windshield between approximately five (5) and twenty-five (25) cycles per minute.

ALTERNATIVE

Multiple wiper systems and controls.

ALTERNATIVE

Non-Synchronized Wipers

For non-synchronized wipers, separate controls for each side shall be supplied.

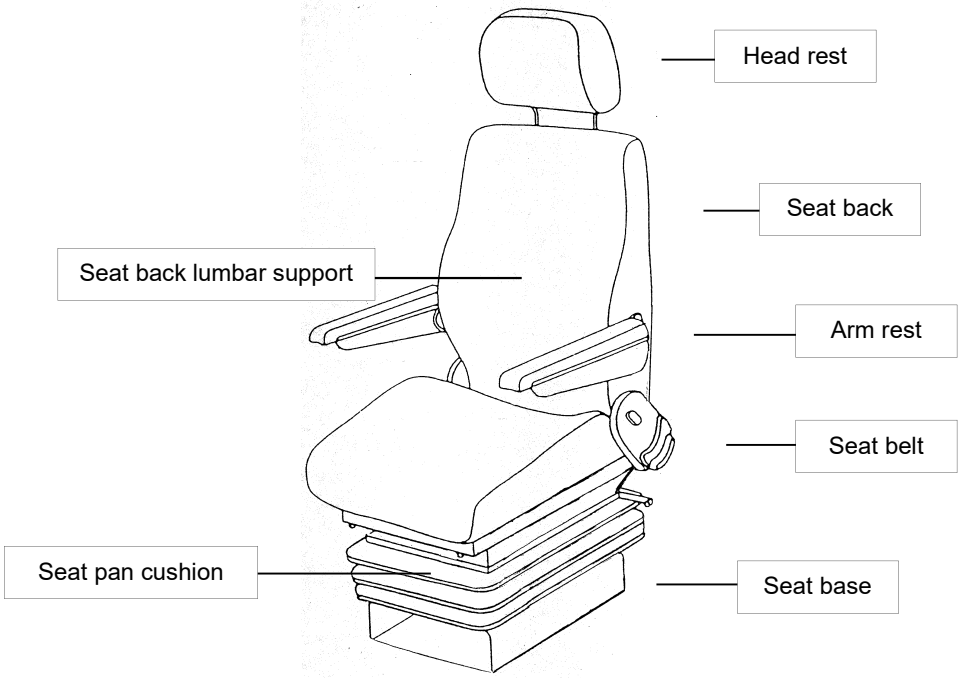
TS 45.2 Windshield Washers

The windshield washer system, when used with the wipers, shall deposit washing fluid evenly and completely wet the entire wiped area.

The windshield washer system shall have a minimum 3-gallon reservoir, located for easy refilling from outside the bus. Reservoir pumps, lines and fittings shall be corrosion-resistant and must include a means to determine fluid level.

TS 46 Driver's Seat

FIGURE 5
Driver's Seat



TS 46.1 Dimensions

The driver's seat shall be comfortable and adjustable so that people ranging in size from a 95th-percentile male to a 5th-percentile female may operate the bus. The driver's seat shall be USSC 9100ALX3, air seat or approved equal. This seat shall be equipped with an optional air-adjustable lumber back support, headrest, and armrests. Nothing shall be installed behind the driver's seat that limits the full range of travel. The driver's seat shall be black leather. One seat belt extender, (approx. 18") shall be included with each driver's seat.

TS 46.1.1 Seat Pan Cushion Length

Measurement shall be from the front edge of the seat pan to the rear at its intersection with the seat back. The adjustment of the seat pan length shall be no less than 16.5 in. at its minimum length and no more than 20.5 in. at its maximum length.

TS 46.1.2 Seat Pan Cushion Height

DEFAULT

Dimensions

Measurement shall be from the cab floor to the top of the level seat at its center midpoint. The seat shall adjust in height from a minimum of 14 in., with a minimum 6 in. vertical range of adjustment.

TS 46.1.3 Seat Pan Cushion Slope

Measurement is the slope of the plane created by connecting the two high points of the seat, one at the rear of the seat at its intersection with the seat back and the other at the front of the seat just before it waterfalls downward at the edge. The slope can be measured using an inclinometer and shall be stated in degrees of incline relative to the horizontal plane (0 deg). The seat pan shall adjust in its slope from no less than plus 12 deg (rear ward “bucket seat” incline) to no less than minus 5 deg (forward slope).

TS 46.1.4 Seat Base Fore/Aft Adjustment

Measurement is the horizontal distance from the heel point to the front edge of the seat. The minimum and maximum distances shall be measured from the front edge of the seat when it is adjusted to its minimum seat pan depth (approximately 15 in.). On all low-floor buses, the seat base shall travel horizontally a minimum of 9 in. It shall adjust no closer to the heel point than6 in. On all high-floor buses, the seat base shall travel a minimum of9 in. and adjust no closer to the heel point than 6 in.

TS 46.1.5 Seat Pan Cushion Width

Measurement is the horizontal distance across the seat cushion. The seat pan cushion shall be 17 to 21 in. across at the front edge of the seat cushion and 20 to 23 in. across at the side bolsters.

TS 46.1.6 Seat Suspension

The driver’s seat shall be appropriately dampened to support a minimum weight of 400 lbs. The suspension shall be capable of dampening adjustment in both directions.

Rubber bumpers shall be provided to prevent metal-to-metal contact.

TS 46.1.7 Seat Back

Width

Measurement is the distance between the outermost points of the front of the seat back, at or near its midpoint in height. The seat back width shall be no less than 19 in. Seat back will include dual recliner gears on both sides of the seat.

Height

Standard height seat back.

TS 46.1.8 Headrests

DEFAULT

Adjustable headrest.

TS 46.1.9 Seat Back Lumbar Support

Measurement is from the bottom of the seat back at its intersection with the seat pan to the top of the lumbar cushioning. The seat back shall provide adjustable-depth lumbar back support with three individual operating lumbar cells within a minimum range of 7 to 11 in.

TS 46.1.10 Seat Back Angle Adjustment

The seat back angle shall be measured relative to a level seat pan, where 90 deg is the upright position and 90 deg-plus represents the amount of recline.

The seat back shall adjust in angle from a minimum of no more than 90 deg (upright) to at least 105 deg (reclined), with infinite adjustment in between.

TS 46.2 Seat Belt

The belt assembly should be an auto-locking retractor (ALR). All seat belts should be stored in automatic retractors. The belts shall be mounted to the seat frame so that the driver may adjust the seat without resetting the seat belt.

The seat and seatbelt assemblies as installed in the bus shall withstand static horizontal forces as required in FMVSS 207 and 210.

ALTERNATIVE

Lap and Shoulder (Three-Point) Seat Belt

3 Point, Orange Shoulder, **Non-Detachable** "Push Nut", With Retractor. Three-point seatbelts must be emergency locking retractor (ELR) in design.

Lap Belt Length

DEFAULT

72 in.

The lap belt assembly shall be a minimum of 72 in. in length.

TS 46.3 Adjustable Armrest

ALTERNATIVE

One armrest, right side.

TS 46.4 Seat Control Locations

While seated, the driver shall be able to make seat adjustments by hand without complexity, excessive effort or being pinched. Adjustment mechanisms shall hold the adjustments and shall not be subject to inadvertent changes.

TS 46.5 Seat Structure and Materials

Cushions

Cushions shall be fully padded with at least 3 in. of materials in the seating areas at the bottom and back.

Cushion Materials

DEFAULT

Open-cell polyurethane (FMVSS 302).

TS 46.6 Pedestal

DEFAULT
Powder-coated steel.

TS 46.7 Seat Options

Choose among the following:

- seat alarm
- fabric options
- seat air vent
- side bolsters adjustments
- silicone seat cushion

TS 47 Mirrors

TS 47.1 Exterior Mirrors

The bus shall be equipped with corrosion-resistant, outside rearview mirrors mounted with stable supports to minimize vibration. Mirrors shall be firmly attached to the bus to minimize vibration and to prevent loss of adjustment with a breakaway mounting system. Mirrors shall permit the driver to view the roadway along the sides of the bus, including the rear wheels, yet be at a minimum of extension from the side of the vehicle to keep the overall width at a very minimum dimension. Mirrors should be positioned to prevent blind spots.

Mirrors shall retract or fold sufficiently to allow bus washing operations but avoid contact with windshield.

ALTERNATIVE
Exterior mirrors shall be installed with a breakaway mounting system.

ALTERNATIVE
Spring-loaded mirror heads auto return.

ALTERNATIVE
Combination of flat and convex mirrors referred to as transit-specific.

Curbside Mirrors

The curbside rearview mirror shall be mounted so that its lower edge is no less than 76in. above the street surface. A lower mount may be required due to mirror configuration requests.

DEFAULT

Remote Adjustment of Curbside Mirror

The driver shall be able to adjust the curbside mirror remotely while seated in the driving position. The control for remote positioning of the mirror shall be a single switch or device.

ALTERNATIVE

Mirrors with integrated turn signal, both sides.

TS 47.2 Interior Mirrors

Mirrors shall be provided for the driver to observe passengers throughout the bus without leaving the seat and without shoulder movement. The driver shall be able to observe passengers in the front/entrance and rear/exit areas (if applicable), anywhere in the aisle, and in the rear seats.

WINDOWS

TS 48 General

Use with 30ft length: A minimum of 6000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 35ft length: A minimum of 8000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 40ft length: A minimum of 10,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 45ft length: A minimum of 12,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

Use with 60ft length: A minimum of 16,000 sq. in. of window area, including operator and door windows, shall be required on each side of the standard configuration bus.

TS 49 Windshield

The windshield shall permit an operator's field of view as referenced in SAE Recommended Practice J1050.The vertically upward view shall be a minimum of 14 deg, measured above the horizontal and excluding any shaded band. The vertically downward view shall permit detection of an object 3½ft high no more than 2 ft. in front of the bus. The horizontal view shall be a minimum of 90 deg above the line of sight. Any binocular obscuration due to a center divider may be ignored when determining the 90 deg requirement, provided that the divider does not exceed a 3deg angle in the operator's field of view. Windshield pillars shall not exceed 10 deg of binocular obscuration. The windshield shall be designed and installed to minimize external glare as well as reflections from inside the bus.

The windshield shall be easily replaceable by removing zip-locks from the windshield retaining moldings. Bonded-in-place windshields shall not be used. Winglets may be bonded.

TS 49.1 Glazing

The windshield glazing material shall have a ¼ in. nominal thickness laminated safety glass conforming to the requirements of ANSI Z26.1 Test Grouping AS-1 and the recommended practices defined in SAE J673.

DEFAULT

Shaded Band

The upper portion of the windshield above the driver's field of view shall have a dark, shaded band and marked AS-3, with a minimum luminous transmittance of 5 percent when tested in accordance to ASTM D-1003.

ALTERNATIVE

Partial band required to allow view for camera and mirror viewing.

ALTERNATIVE

One-piece windshield.

TS 50 Driver's Side Window

The driver's side window shall be the sliding type, requiring only the rear half of the sash to latch upon closing, and shall open sufficiently to permit the seated operator to easily adjust the street-side outside rearview mirror. When in an open position, the window shall not rattle or close during braking. This window section shall slide in tracks or channels designed to last the service life of the bus. The operator's side window shall not be bonded in place and shall be easily replaceable. The glazing material shall have a single-density tint.

The driver's view, perpendicular through operator's side window glazing, should extend a minimum of 33 in. (840 mm) to the rear of the heel point on the accelerator, and in any case must accommodate a 95th percentile male operator. The view through the glazing at the front of the assembly should begin not more than 26 in. (560 mm) above the operator's floor to ensure visibility of an under-mounted convex mirror. Driver's window construction shall maximize ability for full opening of the window.

The operator's side window and destination sign(s) upper glazing shall be ThremoGuard BlueSpruce70, manufactured out of Pomona, CA or approved equal. The glazing shall have a ¼ inch nominal thickness and be laminated heat-treated safety glass. The glazing tint shall be blue in color and comply with AS@ DOT requirements, blocking 99% of the UV and allowing less than 6% of the infrared heat to pass through the pane.

The design shall prevent sections from freezing closed in the winter. Light transmittance shall be 75 percent on the glass area below 53 in. from the operator platform floor. On the top-fixed-over-bottom-slider configuration, the top fixed area above 53 in. may have a maximum 5 percent light transmittance.

DEFAULT

Standard Driver's Side Window, Framed

Agency to choose from the following options:

- Full slider

ALTERNATIVE

Quick Change Operator's Side Window

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

ALTERNATIVE

Standard Driver's Side Window, Framed

Agency to choose from the following options:

- Full slider

TS 51 Side Windows

TS 51.1 Configuration

Side windows shall not be bonded in place, but shall be easily replaceable without disturbing adjacent windows and shall be mounted so that flexing or vibration from engine operation or normal road excitation is not apparent. All aluminum and steel material will be treated to prevent corrosion.

Side window glazing shall be ThremoGuard BlueSpruce70, manufactured out of Pomona, CA or approved equal. The glazing shall have a ¼ inch nominal thickness and be laminated heat-treated safety glass. The glazing tint shall be blue in color and comply with AS@ DOT requirements, blocking 99% of the UV and allowing less than 6% of the infrared heat to pass through the pane.

TS 51.2 Emergency Exit (Egress) Configuration

DEFAULT

Minimum Egress

All side windows shall be fixed in position, except as necessary to meet the emergency escape requirements. Every other side window shall be an emergency escape-type and shall be clearly marked as such. The rear window on each side shall be an emergency escape-type also.

DEFAULT

Standard Passenger Side Window Configurations

Agency to choose from the following options:

- Framed windows

ALTERNATIVE

Quick Change Passenger Side Windows

Glazing in the window assembly shall be replaced without removing the window from its installed position on the bus or manipulation of the rubber molding surrounding the glazing. The glazing shall be held in place mechanically by a formed metal extruded ring constructed to last the life of the vehicle.

DEFAULT

Framed

Agency to choose from the following options:

- Solid frameless panel windows (for 60' articulated bus only)

TS 51.3 Configuration

ALTERNATIVE

Operable Windows with Inward-Opening Transom Panels (Fixed Bottom, Tip-In Top)

NOT NEENED

TS 51.4 Materials

DEFAULT

Safety Glass Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1-1996 Test Grouping 2 and the recommended practices defined in SAE J673.

DEFAULT

Windows on the bus sides and in the rear door shall be tinted a neutral color, complementary to the bus exterior. The maximum solar energy transmittance shall not exceed 37 percent, as measured by ASTM E-424. Luminous transmittance shall be measured by ASTM D-1003. Windows over the destination signs shall not be tinted.

ALTERNATIVE

All side and door windows shall be heat-rejecting glass with a solar heat gain coefficient (SHGC) of no greater than 40 percent and a visible light transmission of no less than 75 percent. Lower light transmission may be considered if SHGC values of less than 40 percent can be attained.

DEFAULT (DARK)

27 percent luminous transmittance.

DEFAULT

Safety Glass Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness tempered safety glass. The material shall conform to the requirements of ANSI Z26.1 Test Grouping 2 and the recommended practices defined in SAE J673.

ALTERNATIVE

Laminated Glazing Panels

Side windows glazing material shall have a minimum of 3/16 in. nominal thickness laminated safety glass. The material shall conform to applicable requirements of ANSI Z26.1 and the recommended practices defined in SAE J673.

NOTE: All glass treatments must be permanent, within the glass and/or in the center membrane. Surface films are not permitted.

SHGC and light transmission performance shall be defined by the National Fenestration Rating Council.

TS 51.5 Rear Window

DEFAULT

No requirement for rear window.

HEATING, VENTILATING AND AIR CONDITIONING

TS 52 Capacity and Performance

The HVAC climate control system shall be capable of controlling the temperature and maintaining the humidity levels of the interior of the bus as defined in the following paragraphs.

DEFAULT

HVAC equipped. See below for configuration.

The air conditioning system is to be a ThermoKing RLFE1-M1 roof top system and or the TE14-EH rear mount system, or approved equal. The HVAC system shall have ducts to diffuse air throughout the vehicle, particularly over the passenger positions. The system shall use a minimum 2-speed blower system. All motors shall be brush-less type with heavy-duty bearings sealed with synthetic grease for long life. High pressure and Low pressure gauges shall be installed in each system to provide maintenance personnel immediate access to these gauges to determine status of Freon pressure during troubleshooting.

The cabin air purification system will be a CCT- Climate Comfort Technologies ionization system.

ALTERNATIVE

Hotter Ambient Conditions

The air conditioning portion of the HVAC system shall be capable of reducing the passenger compartment temperature from 110to 70°F ±3°F in less than 30 minutes after system engagement for 30, 35 and 40ft buses. Engine temperature shall be within the normal operating range at the time of start-up of the cool-down test, and the engine speed shall be limited to fast idle at three-quarters max governed speed that may be activated by a driver-controlled device. During the cool-down period, the refrigerant pressure shall not exceed safe high-side pressures, and the condenser discharge air temperature, measured 6 in. from the surface of the coil, shall be less than 45 °F above the condenser inlet air temperature. No simulated solar load shall be used. There shall be no passengers on board, and the doors and windows shall be closed.

Each individual vehicle must pass the Fort Worth Air Conditioning test prior to bidding. The inside temperature of the vehicle must drop from 110 degrees F. to 70 degrees F. in thirty (30) minutes. Test protocol shall be as follows:

A. Bus shall be placed in the paint booth with all doors and windows open.
B. Temperature reading devices shall be placed in the approximated facial area of the driver; above the front axle, rear axle and midway of axles, 36 - 40" above floor.
C. Paint booth shall be brought up and temperature maintained at 110 degrees +3 degrees.
D. Vehicle shall be heat soaked until all sensors have indicated 110 degrees for a period of three hours.
F. Close all doors and windows.
G. Start bus and allow engine to reach normal operating temperature
H. Turn fast idle switch ON
I. Turn ac system to HI including driver's blower
J. Record initial reading and begin test
K. Record individual reading at five-minute intervals
L. At the end of 30 minutes, *all* readings shall be at or below 70 degrees (not an average)

This test will be conducted at the factory prior to acceptance by on-site inspectors. However, due to the excessive heat experienced in Fort Worth, the unit will be tested upon receipt in Fort Worth. Each individual coach must pass this test at the Fort Worth facility prior to acceptance of the coach for payment.

ALTERNATIVE

R407C

The air conditioning system shall meet these performance requirements using R407C. High pressure and Low pressure gauges shall be installed in each system to provide maintenance personnel immediate access to these gauges to determine status of Freon pressure during troubleshooting.

TS 53 Controls and Temperature Uniformity

The HVAC system excluding the driver's heater/defroster shall be centrally controlled with an advanced electronic/diagnostic control system with provisions for extracting/reading data. The system shall be compliant with J1939 Communication Protocol for receiving and broadcasting of data.

Hot engine coolant water shall be delivered to the HVAC system driver's defroster/heater and other heater cores by means of an auxiliary coolant pump, sized for the required flow, which is brushless and sealless having a minimum maintenance-free service life for both the brushless motor and the pump of at least 40,000 hours at full power.

ALTERNATIVE

Manually Adjustable Temperature Control Set Point

The climate control system shall have the provision to allow the driver to adjust the temperature control set point at a minimum of between 68 and 72 °F. From then on, all interior climate control system requirements shall be attained automatically, unless re-adjusted by the driver.

The driver shall have full control over the defroster and driver's heater. The driver shall be able to adjust the temperature in the driver's area through air distribution and fans. The interior climate control system shall switch automatically to the ventilating mode if the refrigerant compressor or condenser fan fails.

HVAC control system to be used is Inteligaire III

Auxiliary Coolant pump (boost Pump) will be made by EMP

Interior temperature distribution shall be uniform to the extent practicable to prevent hot and/or cold spots. After stabilization with doors closed, the temperatures between any two points in the passenger compartment in the same vertical plane, and 6 to 72 in. above the floor, shall not vary by more than 5 °F with doors closed. The interior temperatures, measured at the same height above the floor, shall not vary more than ±5 °F from the front to the rear from the average temperature determined in accordance with APTA's "Recommended Instrumentation and Performance Testing for Transit Bus Air Conditioning System." Variations of greater than ±5 °F will be allowed for limited, localized areas provided that the majority of the measured temperatures fall within the specified requirement.

TS 53.1 Auxiliary Heater

DEFAULT

No auxiliary heater.

TS 54 Air Flow

TS 54.1 Passenger Area

The cooling mode of the interior climate control system shall introduce air into the bus at or near the ceiling height at a minimum rate of 25 cubic ft. per minute (cfm) per passenger based on the standard configuration bus carrying a number of passengers equal to 150 percent of the seated load. Airflow shall be evenly distributed throughout the bus, with air velocity not exceeding 100 ft. per minute on any passenger. The ventilating mode shall provide air at a minimum flow rate of 20 cfm per passenger.

Airflow may be reduced to 15 cfm per passenger (150 percent of seated load) when operating in the heating mode. The fans shall not activate until the heating element has warmed sufficiently to ensure at least 70 °F air outlet temperature. The heating air outlet temperature shall not exceed 120 °F under any normal operating conditions.

The climate control blower motors and fan shall be designed such that their operation complies with the interior noise level requirements.

DEFAULT

No "Fresh Air" Requirements

To be used by agencies that have an operating profile where the door opening cycle results in effectively providing an adequate "fresh air" mixture.

ALTERNATIVE

Climate Comfort Technologies Electronic Air Cleaner: An electronic air cleaner shall be mounted in either the supply duct, return air plenum or as directed by the manufacturer to optimize concentrations. The equipment shall maintain each ion polarity to a minimum of 2,000 ions/cm3 as measured within 12" of the air output on each side of the supply duct. Some specific localized variations may be permitted, provided the overall output achieves and/or exceeds the required concentrations. Unipolar technology, particulate filters or glass/steel mesh tubes designs shall not be acceptable. The technology shall not be compromised or reduced by high humidity levels. The equipment must be able to conform to UL 867-2007. System shall be housed in an aluminum powder-coated enclosure and have internal short circuit protection, overload protection, and automatic fault reset. Climate Comfort Technologies Model CCT24V-1 or a tested and approved equal.

The bus interior climate control system shall deliver at least 100 cfm of air to the driver's area when operating in the ventilating and cooling modes. Adjustable nozzles shall permit variable distribution or shutdown of the airflow. Airflow in the heating mode shall be reduced proportionally to the reduction of airflow into the passenger area. The windshield defroster unit shall meet the requirements of SAE Recommended Practice J382, "Windshield Defrosting Systems Performance Requirements," and shall have the capability of diverting heated air to the

driver's feet and legs. The defroster or interior climate control system shall maintain visibility through the driver's side window.

TS 54.2 Controls for the Climate Control System (CCS)

The controls for the driver's compartment for heating, ventilation and cooling systems shall be integrated and shall meet the following requirements:

- The heat/defrost system fan shall be controlled by a separate switch that has an "off" position and at least two positions for speed control. All switches and controls shall preclude the possibility of clothing becoming entangled, and shields shall be provided, if required. If the fans are approved by the Agency, an "on/off" switch shall be located to the right of or near the main defroster switch.
- A manually operated control valve shall control the coolant flow through the heater core.
- If a cable-operated manual control valve is used, then the cable length shall be kept to a minimum to reduce cable seizing. Heater water control valves shall be "positive" type, closed or open. The method of operating remote valves shall require the concurrence of the Agency project manager.

TS 54.3 Driver's Compartment Requirements

A separate heating, ventilation and defroster system for the driver's area shall be provided and shall be controlled by the driver. The system shall meet the following requirements:

- The heater and defroster system shall provide heating for the driver and heated air to completely defrost and defog the windshield, driver's side window, and the front door glasses in all operating conditions. Fan(s) shall be able to draw air from the bus body interior and/or exterior through a control device and pass it through the heater core to the defroster system and over the driver's feet. A minimum capacity of 100 cfm shall be provided. The driver shall have complete control of the heat and fresh airflow for the driver's area.
- The defroster supply outlets shall be located at the lower edge of the windshield. These outlets shall be durable and shall be free of sharp edges that can catch clothes during normal daily cleaning. The system shall be such that foreign objects such as coins or tickets cannot fall into the defroster air outlets. Adjustable ball vents or louvers shall be provided at the left of the driver's position to allow direction of air onto the side windows.

  A ventilation system shall be provided to ensure driver comfort and shall be capable of providing fresh air in both the foot and head areas. Vents shall be controllable by the driver from the normal driving position. Decals shall be provided, indicating "operating instructions" and "open" and "closed" positions. When closed, vents shall be sealed to prevent the migration of water or air into the bus.

TS 54.4 Driver's Cooling

ALTERNATIVE

Air from the evaporator shall be provided to the driver's area through vents located on the dash in front of the driver.

ALTERNATIVE

Driver's booster blower.

TS 55 Air Filtration

Air shall be filtered before entering the AC system and being discharged into the passenger compartment. The filter shall meet the ANSI/ASHRAE 52.1 requirement for 5 percent or better atmospheric dust spot efficiency, 50 percent weight arrestance, and a minimum dust holding capacity of 120 g per 1000 cfm cell. Air filters shall be easily removable for service.

ALTERNATIVE

Disposable Type Filters

Air filters shall be of disposable type.

TS 56 Roof Ventilators

Each ventilator shall be easily opened and closed manually. When open with the bus in motion, this ventilator shall provide fresh air inside the bus. The ventilator shall cover an opening area no less than 425 sq. in. and shall be capable of being positioned as a scoop with either the leading or trailing edge open no less than 4 in., or with all four edges raised simultaneously to a height of no less than 3½ in. An escape hatch shall be incorporated into the roof ventilator. Roof ventilator(s) shall be sealed to prevent entry of water when closed.

ALTERNATIVE

Two Roof Ventilators

Two roof ventilators shall be provided in the roof of the bus, one approximately over or just forward of the front axle and the other approximately over the rear axle.

TS 57 Maintainability

Manually controlled shut-off valves in the refrigerant lines shall allow isolation of the compressor and dehydrator filter for service. To the extent practicable, self-sealing couplings utilizing O-ring seals shall be used to break and seal the refrigerant lines during removal of major components, such as the refrigerant compressor. Shut-off valves may be provided in lieu of self-sealing couplings. The condenser shall be located to efficiently transfer heat to the atmosphere and shall not ingest air warmed above the ambient temperature by the bus mechanical equipment, or to discharge air into any other system of the bus. The location of the condenser shall preclude its

obstruction by wheel splash, road dirt or debris. HVAC components located within 6 in. of floor level shall be constructed to resist damage and corrosion.

DEFAULT
High and low refrigerant pressure electronic gauges to be located in the return air area.

NOTE: The Agency may include the following sections if an alternative for colder ambient performance is specified above.

TS 58 Entrance/Exit Area Heating

DEFAULT
No requirements for entrance/exit area heating.

TS 59 Floor-Level Heating

TS 59.1 Transit Coach

DEFAULT
No requirements for floor-level heating.

EXTERIOR PANELS, FINISHES AND EXTERIOR LIGHTING

TS 60 Design

The bus shall have a clean, smooth, simple design, primarily derived from bus performance requirements and passenger service criteria. The exterior and body features, including grilles and louvers, shall be shaped to facilitate cleaning by automatic bus washers without snagging washer brushes. Water and dirt shall not be retained in or on any body feature to freeze or bleed out onto the bus after leaving the washer. The body and windows shall be sealed to prevent leaking of air, dust or water under normal operating conditions and during cleaning in automatic bus washers for the service life of the bus.

Exterior panels shall be sufficiently stiff to minimize vibration, drumming or flexing while the bus is in service. When panels are lapped, the upper and forward panels shall act as a watershed. However, if entry of moisture into the interior of the vehicle is prevented by other means, then rear cap panels may be lapped otherwise. The windows, hatches and doors shall be able to be sealed. Accumulation of spray and splash generated by the bus's wheels shall be minimized on windows and mirrors.

TS 60.1 Materials

Body materials shall be selected and the body fabricated to reduce maintenance, extend durability and provide consistency of appearance throughout the service life of the bus. Detailing shall be kept simple, and add-on devices and trim shall be minimized and integrated into the basic design.

DEFAULT
No requirement for protection against graffiti/vandalism for body material surfaces.

TS 60.2 Roof-Mounted Equipment (Transit Coach)

A non-skid, clearly marked walkway or steps shall be incorporated on the roof to provide access to equipment without damaging any system or bus paneling.

TS 61 Pedestrian Safety

Exterior protrusions along the side and front of the bus greater than ½ in. and within 80 in. of the ground shall have a radius no less than the amount of the protrusion. The exterior rearview mirrors, cameras and required lights and reflectors are exempt from the protrusion requirement. Advertising frames shall protrude no more than ⅞ in. from the body surface. Grilles, doors, bumpers and other features on the sides and rear of the bus shall be designed to minimize toeholds or handholds.

Exterior protrusions shall not cause a line-of-sight blockage for the driver.

TS 62 Repair and Replacement

TS 62.1 Side Body Panels (Transit Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired in lengths not greater than 12.5 ft.

DEFAULT

Standard attachment of side body panels.

ALTERNATIVE

Easily Replaceable Lower Side Body Panels

The lower section (approximately 17.5 in.) of the side body panels (low-floor buses) or skirt panels (high-floor buses) shall be made of impact-resistant material and shall be easily and quickly replaceable.

ALTERNATIVE

Easily Replaceable Full-Height Side Body Panels

Full-height side body panels between the window and floor shall be easily and quickly replaceable in sections.

TS 62.2 Side Body Panels (Commuter Coach)

Structural elements supporting exterior body panels shall allow side body panels below the windows to be repaired.

TS 63 Rain Gutters

Rain gutters shall be provided to prevent water flowing from the roof onto the passenger doors and driver's side window. When the bus is decelerated, the gutters shall not drain onto the windshield, driver's side window or door boarding area. Cross sections of the gutters shall be adequate for proper operation.

TS 64 License Plate Provisions

Provisions shall be made to mount standard-size U.S./Canada license plates per SAE J686 on the front and rear of the bus. These provisions shall direct-mount or recess the license plates so that they can be cleaned by automatic bus-washing equipment without being caught by the brushes. The rear license plate provision shall be illuminated per SAE J587.

DEFAULT

No plate or holder provision is required.

TS 65 Rub rails

ALTERNATIVE

Requirement for Rub Rails

Rub rails composed of flexible, resilient material shall be provided to protect both sides of the bus body from damage caused by minor sideswipe accidents with automobiles. Rub rails shall have vertical dimensions of no less than 2 in. (50 mm) with the centerline no higher than 35 in. above the ground between the wheel wells. The rub rails shall withstand impacts of 200 ft-lbs of energy from a steel-faced spherical missile no less than 9 in. in diameter and of a 500lbload applied anywhere along their length by a rigid plate 1 ft. in length, wider than the rub rail, and with a ¼ in. end radius, with no visible damage to the rub rail, retainer or supporting structure.

The rub rail may be discontinued at doorways, wheel wells and articulated joints if applicable. A damaged portion of the rub rail shall be replaceable without requiring removal or replacement of the entire rub rail.

NOTE: Installation of rub rails may preclude the installation and/or size of exterior advertising signs or racks.

TS 66 Fender Skirts

DEFAULT

Features to minimize water spray from the bus in wet conditions shall be included in wheel housing design. Any fender skirts shall be easily replaceable. They shall be flexible if they extend beyond the allowable body width. Wheels and tires shall be removable with the fender skirts in place.

TS 67 Wheel Covers (Transit Coach)

TS 67.1 Splash Aprons

DEFAULT

Standard Splash Aprons

If required, Splash aprons, composed of ¼ in. minimum composition or rubberized fabric, shall be installed behind and/or in front of wheels as needed to reduce road splash and to protect under floor components. The splash aprons shall extend downward to within 6 in. off the road surface at static conditions. Apron widths shall be no less than tire widths. Splash aprons shall be bolted to the bus understructure. Splash aprons and their attachments shall be inherently weaker than the structure to which they are attached. The flexible portions of the splash aprons shall not be included in the road clearance measurements. Splash apron shall be installed as necessary to protect the wheelchair loading device from road splash. Other splash aprons shall be installed where necessary to protect bus equipment.

ALTERNATIVE (TRANSIT COACH)

If required, Full width rear splash apron.

TS 68 Service Compartments and Access Doors

TS 68.1 Access Doors (Transit Coach)

Conventional or pantograph hinged doors shall be used for the engine compartment and for all auxiliary equipment compartments, including doors for checking the quantity and adding to the engine coolant, engine lubricant and transmission fluid. Access openings shall be sized for easy performance of tasks within the compartment, including tool operating space. Access doors shall be of rugged construction and shall maintain mechanical integrity and function under normal operations throughout the service life of the bus. They shall close flush with the body surface. All doors shall be hinged at the top or on the forward edge and shall be prevented from coming loose or opening during transit service or in bus washing operations. All access doors shall be retained in the open position by props or counterbalancing with over-center or gas-filled springs with safety props and shall be easily operable by one person. Springs and hinges shall be corrosion resistant. Latch handles shall be flush with, or recessed behind, the body contour and shall be sized to provide an adequate grip for opening. Access doors, when opened, shall not restrict access for servicing other components or systems.

The front and rear door glazing shall be ThremoGuard BlueSpruce70, manufactured out of Pomona, CA or approved equal. The tints for the front and rear door shall match all tints in the driver and passenger window assembly locations.

If precluded by design, the manufacturer shall provide door design information specifying how the requirements are met.

TS 69 Access Door Latch/Locks

DEFAULT

Requirement for Latches on Access Doors

Access doors larger than 100 sq. in. in area shall be equipped with corrosion-resistant flush-mounted latches or locks except for coolant and fuel fill access doors. All such access doors that require a tool to open shall be standardized throughout the vehicle and will require a nominal 5/16 in. square male tool to open or lock.

TS 70 Bumpers

TS 70.1 Location

Bumpers shall provide impact protection for the front and rear of the bus with the top of the bumper being 27 in., ±2 in., above the ground. Bumper height shall be such that when one bus is parked behind another, a portion of the bumper faces will contact each other.

TS 70.2 Front Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 5mph impact of the bus at curb weight with a fixed, flat barrier perpendicular to the bus's longitudinal centerline. The bumper shall return to its pre-impact shape within 10 minutes of the impact. The bumper shall protect the bus from damage as a result of 6.5 mph impacts at any point by the common carriage with contoured impact surface defined in Figure 2 of FMVSS 301 loaded to 4000lbs parallel to the longitudinal centerline of the bus. It shall protect the bus from damage as a result of 5.5mph impacts into the corners at a 30deg angle to the longitudinal centerline of the bus. The energy absorption system of the bumper shall be independent of every power system of the bus and shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

ALTERNATIVE

Mounting provisions for integrated bike rack. Vehicle shall be equipped with a Byk-Rak bicycle rack that holds two (2) bicycles. The rack shall be mounted to the front bumper with a "Quick Removable Mount with Deployment sensor" (part # B4032DSN 2-position rack, & part # B002HDSB pivot mounting bracket assembly w/ sensor) manufactured by Byk-Rak LLC. 1940 W. Stewart St. Owosso, MI 48867, direct line (989)-729-5890. An approved equal must also utilize a quick mount system.

Both front and rear bumpers shall be black "Help" energy absorbent bumpers produced by Romeo Rim, Inc., or approved equal.

ALTERNATIVE

Integrated Design with Recessed Middle Portion

The bumper shall be an integrated design with the coach styling and be recessed in the middle portion to provide for mounting of a bike rack if necessary.

TS 70.3 Rear Bumper

No part of the bus, including the bumper, shall be damaged as a result of a 2mph impact with a fixed, flat barrier perpendicular to the longitudinal centerline of the bus. The bumper shall return to its pre-impact shape within 10 minutes of the impact. When using a yard tug with a smooth, flat plate bumper 2 ft. wide contacting the horizontal centerline of the rear bumper, the bumper shall provide protection at speeds up to 5 mph, over pavement discontinuities up to 1 in. high, and at accelerations up to 2 mph/sec. The rear bumper shall protect the bus when impacted anywhere along its width by the common carriage with contoured impact surface defined in Figure 2 of FMVSS 301 loaded to 4000 lbs., at 4 mph parallel to or up to a 30degangle to the longitudinal centerline of the bus. The rear bumper shall be shaped to preclude unauthorized riders standing on the bumper. The bumper shall not require service or maintenance in normal operation during the service life of the bus. The bumper may increase the overall bus length specified by no more than 7 in.

TS 70.4 Bumper Material

Bumper material shall be corrosion-resistant and withstand repeated impacts of the specified loads without sustaining damage. These bumper qualities shall be sustained throughout the service life of the bus.

TS 71 Finish and Color

TS 71.1 Appearance

All exterior surfaces shall be smooth and free of wrinkles and dents. Exterior surfaces to be painted shall be properly prepared as required by the paint system Supplier prior to application of paint to ensure a proper bond between the basic surface and successive coats of original paint for the service life of the bus. Drilled holes and cutouts in exterior surfaces shall be made prior to cleaning, priming and painting, where possible, to prevent corrosion. The bus shall be painted prior to installation of exterior lights, windows, mirrors and other items that are applied to the exterior of the bus. Body filler materials may be used for surface dressing, but not for repair of damaged or improperly fitted panels.

Paint shall be applied smoothly and evenly with the finished surface free of visible dirt and the following other imperfections:

- blisters or bubbles appearing in the topcoat film
- chips, scratches or gouges of the surface finish
- cracks in the paint film
- craters where paint failed to cover due to surface contamination
- overspray
- peeling
- runs or sags from excessive flow and failure to adhere uniformly to the surface
- chemical stains and water spots
- dry patches due to incorrect mixing of paint activators
- buffing swirls

All exterior finished surfaces shall be impervious to diesel fuel, gasoline and commercial cleaning agents. Finished surfaces shall resist damage by controlled applications of commonly used graffiti-removing chemicals.

Proper adhesion between the basic surface and successive coats of the original paint shall be measured using an Elcometer adhesion tester as outlined in ASTM D4541-85. Adhesion shall be a minimum 300 ft-lbs. The bus manufacturer shall supply test samples of the exterior surface for each step of the painting process that may be subject to adhesion testing per ASTM G4541-87 and ASTM D4145-85. ASTM D4541-93 may be used for inspection testing during assembly of the vehicle.

DEFAULT

Standard Contractor exterior paint finish quality.

ALTERNATIVE

High Gloss External Paint Finish Quality

Painted surfaces shall have a minimum 95 gloss and an orange peel rating of 7 or more on the Advanced Coating Technologies, Inc., orange peel standard panels set #APR 14941 or Agency accepted wave scan equipment. Paint shall last a minimum of six years with a minimum gloss of 90 as measured in ASTM E97-92, "Standard Test Method for Directional Reflectance."

DEFAULT

Exterior painting and stripping shall be painted with DuPont Imron Elite Base coat (898253EB) and DuPont Imron Elite clear coat paint (8840S), or approved equal.

ALTERNATIVE

Maintenance-Free Exterior Finish, Color Impregnated Panels or Unpainted Panels

Except for periodic cleaning, exterior surfaces of the bus shall be maintenance free, permanently colored and not require refinish/repaint for the life of the vehicle. In general, the exterior surfaces shall be white. Durable, peel-resistant, pressure-sensitive appliqués shall be used for any striping and coloring required.

NOTE: The Agency should insert approved paints, color scheme and graphics.

TS 72 Decals, Numbering and Signing

Monograms, numbers and other special signing shall be applied to the inside and outside of the bus as required. Signs shall be durable and fade-, chip- and peel-resistant. They may be painted signs, decals or pressure-sensitive appliqués. All decals shall be installed per the decal Supplier recommendations. Signs shall be provided in compliance with the ADA requirements defined in 49 CFR Part 38, Subpart B, 38.27.

4-digit bus numbers located inside as near as possible to the center of the front header, 3" in height

On exterior front and 2 sides of vehicle, 4-digit numbers are to be provided using A3M@, 4" reflective pre-spaced, die-cut numbers (numbering sequence and locations to be provided by the FWTA after bid award)

On exterior rear of vehicle, 4-digit numbers using A3M@, 6" reflective, pre-spaced, die-cut numbers

On exterior roof of vehicle, a 24" 4-digit number will be placed no more than 5' from the front of vehicle. Numerals will be black and read from left to right when viewing from the rear of the vehicle. Decal must be heavy duty quality to last against direct sunlight.

- WATCH YOUR STEP to be mounted on the front top riser step, a minimum of 2" in height
- WELCOME ABOARD to be mounted on the front lower riser step, a minimum of 2" in height
- PLEASE REMAIN SEATED UNTIL COACH COMES TO A COMPLETE STOP
- Fire Extinguisher
- Exit Door Emergency Instructions
- "Federal law prohibits operation of this coach with anyone standing forward of the white line"

Any driver instructions necessary are to be furnished and placed by the bidder

Vehicle height & width decal to be placed in clear view of the seated driver.

NOTICE: Bidders will submit samples of all signs and decals as well as detailed layouts of all lettering and sign locations for approval prior to bid opening.

All decals shall be a minimum of 0.24 mm in thickness.

TS 72.1 Passenger Information

ADA priority seating signs as required and defined by 49 CFR shall be provided to identify the seats designated for passengers with disabilities.

Requirements for a public information system in accordance with 49 CFR shall be provided.

TS 73 Exterior Lighting

All exterior lights shall be designed to prevent entry and accumulation of moisture or dust. Lamps, lenses and fixtures shall be interchangeable to the extent practicable. Two hazard lamps at the rear of the bus shall be visible from behind when the engine service doors are opened, and should be of the largest size available with vehicle structure. Light lenses shall be designed and located to prevent damage when running the vehicle through an automatic bus washer.

DEFAULT

Commercially available LED-type lamps shall be utilized at all exterior lamp locations.

ALTERNATIVE

Contractor to provide details of exterior lighting system.

DEFAULT

Standard Lamps

All LED lamps shall be standard installation of the OEM. The entire assembly shall be specifically coated to protect the light from chemical and abrasion degradation.

ALTERNATIVE

Potted Lamps

LED lamps shall be potted type and designed to last the life of the bus.

DEFAULT

Larger Size

LED lamps used for tail, brake and turn signal lamps shall be a minimum of 7 in. in diameter.

ALTERNATIVE

Larger Size

LED lamps used for tail, brake and turn signal lamps shall be a minimum of 7 in. in diameter.

ALTERNATIVE

Front marker (clearance) lights along with lights located on the roof and sides of the bus shall have protective shields or be of the flush mount type to protect the lens against minor impacts.

TS 73.1Backup Light/Alarm

Visible and audible warnings shall inform following vehicles or pedestrians of reverse operation. Visible reverse operation warning shall conform to SAE Standard J593. Audible reverse operation warning shall conform to SAE Recommended Practice J994 Type C or D.

TS 73.2 Doorway Lighting

Lamps at the front and rear passenger doorways (if applicable) shall comply with ADA requirements and shall activate only when the doors open. These lamps shall illuminate the street surface to a level of no less than 1 foot-candle for a distance of 3 ft. outward from the outboard edge of the door threshold. The lights may be positioned above or below the lower daylight opening of the windows and shall be shielded to protect passengers' eyes from glare.

TS 73.3 Turn Signals

ALTERNATIVE

Wraparound Front Turn Signals

Front turn signals shall be of wraparound design or shall be designed to be visible from the front and the near side of the bus.

TS 73.4 Headlights

Headlamps shall be designed for ease of replacement.

DEFAULT

Standard Installation

Standard OEM headlight installation shall be provided in accordance with federal regulations.

ALTERNATIVE

LED

Headlamps shall be LED/halogen, sealed beam. Low beam headlight shall be Dialight, part number HLC324CB while high beam light shall be standard OEM light with high/low beam controlled by a foot switch.

ALTERNATIVE

Specify Design Life

Headlamps' design life to be specified in units of hours by the Agency. Headlights shall have minimum of six years life expectancy.

TS 73.5 Brake Lights Transit Coach

Brake lights shall be provided, being of the largest size available in vehicle structure and in accordance with federal regulations.

ALTERNATIVE

High and Center Mount Red Brake Lamp

Bus shall include red, high and center mount brake lamp(s) along the backside of the bus in addition to the lower brake lamps required under FMVSS. The high and center mount brake lamp(s) shall illuminate steadily with brake application. Agency specifies the size of the high and center mount brake lamp(s) to be 7 inch round LED

TS 73.6 Service Area Lighting (Interior and Exterior)

LED lamps shall be provided in the engine and all other compartments where service may be required to generally illuminate the area for night emergency repairs or adjustments. These service areas shall include, but not be limited to, the engine compartment, the communication box, junction/apparatus panels and passenger door operator compartments. Lighting shall be adequate to light the space of the service areas to levels needed to complete typical emergency repairs and adjustments. The service area lamps shall be suitable for the environment in which they are mounted.

Engine compartment lamps shall be controlled by a switch mounted near the rear start controls. All other service area lamps shall be controlled by switches mounted on or convenient to the lamp assemblies. Power to the service area lighting shall be programmable. Power shall latch on with activation of the switch and shall be automatically discontinued (timed out) after 30 minutes to prevent damage caused by inadvertently leaving the service area lighting switch in the “on” position after repairs are made.

INTERIOR PANELS AND FINISHES

TS 74 General Requirements

Materials shall be selected on the basis of maintenance, durability, appearance, safety, flammability and tactile qualities. Materials shall be strong enough to resist everyday abuse and be vandalism and corrosion resistant. Trim and attachment details shall be kept simple and un-obtrusive. Interior trim shall be secured to avoid resonant vibrations under normal operational conditions.

Interior surfaces more than 10 in. below the lower edge of the side windows or windshield shall be shaped so that objects placed on them fall to the floor when the coach is parked on a level surface. Any components and other electrical components within close proximity to these surfaces shall also be resistant to this cleaning method.

ALTERNATIVE

Requirements for additional anti-graffiti/vandalism treatments for interior surfaces.

ALTERNATIVE

Internal surfaces, as possible, to be stainless steel or other resistant material.

TS 74.1 Interior Panels

Panels shall be easily replaceable and tamper resistant. They shall be reinforced, as necessary, to resist vandalism and other rigors of transit bus service. Individual trim panels and parts shall be interchangeable to the extent practicable.

DEFAULT

Interior panel required to meet FMVSS 302.

ALTERNATIVE

Fire Resistance

Materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated October 20, 1993.

ALTERNATIVE

Melamine-type material.

TS 74.2 Driver Area Barrier

TS 74.2.1 Transit Coach

A barrier or bulkhead between the driver and the street-side front passenger seat shall be provided. The barrier shall minimize glare and reflections in the windshield directly in front of the barrier from interior lighting during night operation. Location and shape must permit full seat travel and reclining possibilities that can accommodate the shoulders of a 95th-percentile male. The partition shall have a side return and stanchion to prevent passengers from reaching the driver by standing behind the driver's seat. The lower area between the seat and panel must be accessible to the driver. The partition must be strong enough in conjunction with the entire partition assembly for mounting of such equipment as flare kits, fire extinguishers (1.2kg), microcomputer, public address amplifier, etc. The panel should be properly attached to minimize noise and rattles.

DEFAULT (TC)

Wheel-Well-to-Ceiling Configuration of Driver's Barrier

The driver's barrier shall extend from the top of the wheel well to the ceiling the level of the seated driver and shall fit close to the bus side windows and wall to prevent passengers from reaching the driver or the driver's personal effects.

Driver side Barrier

A barrier door that seals the driver in to prevent contact with passengers with a latch to secure door to prevent passenger from opening it while driver is inside. Material shall be clear to prevent driver's visual from being blocked to curbside. Material shall be strong enough to endure being hit or beat with objects.

TS 74.3 Modesty Panels

Sturdy divider panels constructed of durable, unpainted, corrosion-resistant material complementing the interior shall be provided to act as both a physical and visual barrier for seated passengers.

Design and installation of modesty panels located in front of forward-facing seats shall include a handhold or grab handle along its top edge. These dividers shall be mounted on the sidewall and shall project toward the aisle no farther than passenger knee projection in longitudinal seats or the aisle side of the transverse seats. Modesty panels shall extend from at least the window opening of the side windows, and those forward of transverse seats shall extend downward to 1 and 1½ in. above the floor. Panels forward of longitudinal seats shall extend to below the level of the seat cushion. Dividers positioned at the doorways, where applicable, shall provide no less than a 2½ in. clearance between the modesty panel and a fully open, inward opening door, or the path of a deploying flip-out ramp to protect passengers from being pinched. Modesty panels installed at doorways shall be equipped with grab rails if passenger assists are not provided by other means.

The modesty panel and its mounting shall withstand a static force of 250 lbs. applied to a 4 × 4 in. area in the center of the panel without permanent visible deformation.

DEFAULT

Modesty panels shall be installed as stated.

TS 74.4 Front End

The entire front end of the bus shall be sealed to prevent debris accumulation behind the dash and to prevent the driver's feet from kicking or fouling wiring and other equipment. The front end shall be free of protrusions that are hazardous to passengers standing at the front of the standee line area of the bus during rapid decelerations. Paneling across the front of the bus and any trim around the driver's compartment shall be formed metal or composite material. Composite dash panels shall be reinforced as necessary, vandal-resistant and replaceable. All colored, painted and plated parts forward of the driver's barrier shall be finished with a surface that reduces glare. Any mounted equipment must have provision to support the weight of equipment.

TS 74.5 Rear Bulkhead

The rear bulkhead and rear interior surfaces shall be material suitable for exterior skin; painted and finished to exterior quality; or paneled with melamine-type material, composite, scratch-resistant plastic or carpeting and trimmed with stainless steel, aluminum or composite.

The rear bulkhead paneling shall be contoured to fit the ceiling, side walls and seat backs so that any litter or trash will tend to fall to the floor or seating surface when the bus is on a level surface. Any air vents in this area shall be louvered to reduce airflow noise and to reduce the probability of trash or liter being thrown or drawn through the grille. If it is necessary to remove the panel to service components located on the rear bulkhead, then the panel shall be hinged or shall be able to be easily removed and replaced. Grilles where access to or adjustment of equipment is required shall be heavy duty and designed to minimize damage and limit unauthorized access.

TS 74.6 Headlining

Ceiling panels shall be made of durable, corrosion resistant, easily cleanable material. Headlining shall be supported to prevent buckling, drumming or flexing and shall be secured without loose

edges. Headlining materials shall be treated or insulated to prevent marks due to condensation where panels are in contact with metal members. Moldings and trim strips, as required to make the edges tamperproof, shall be stainless steel, aluminum or plastic, colored to complement the ceiling material. Headlining panels covering operational equipment that is mounted above the ceiling shall be on hinges for ease of service but retained to prevent inadvertent opening.

TS 74.7 Fastening

Interior panels shall be attached so that there are no exposed unfinished or rough edges or rough surfaces. Fasteners should be corrosion resistant. Panels and fasteners shall not be easily removable by passengers. Exposed interior fasteners should be minimized, and where required shall be tamper resistant.

TS 74.8 Insulation

Any insulation material used between the inner and outer panels shall minimize the entry and/or retention of moisture. Insulation properties shall be unimpaired during the service life of the bus. Any insulation material used inside the engine compartment shall not absorb or retain oils or water and shall be designed to prevent casual damage that may occur during maintenance operations.

The combination of inner and outer panels on the sides, roof, wheel wells and ends of the bus, and any material used between these panels, shall provide a thermal insulation sufficient to meet the interior temperature requirements. The bus body shall be thoroughly sealed so that the driver or passengers cannot feel drafts during normal operations with the passenger doors closed.

DEFAULT

FTA Docket 90-A

All insulation materials shall comply with the Recommended Fire Safety Practices defined in FTA Docket 90-A, dated October 20, 1993.

TS 74.9 Floor Covering

The floor covering shall have a non-skid walking surface that remains effective in all weather conditions. The floor covering, as well as transitions of flooring material to the main floor and to the entrance and exit area, shall be smooth and present no tripping hazards. Seams shall be sealed/welded per manufacturer's specifications. The standee line shall be approximately 2 in. wide and shall extend across the bus aisle. The color and pattern shall be consistent throughout the floor covering.

Any areas on the floor that are not intended for standees, such as areas "swept" during passenger door operation, shall be clearly and permanently marked.

The floor shall be easily cleaned and shall be arranged to minimize debris accumulation.

A one-piece center strip shall extend from the vertical wall of the rear settee between the aisle sides of transverse seats to the standee line. If the floor is of a bi-level construction, then the center strip shall be one piece at each level. The covering between the center strip and the wheel housings may be separate pieces. At the rear door, however, a separate strip as wide as the door shall extend from the center strip to the outboard edge of the rear/exit area.

The floor under the seats shall be covered with smooth surface flooring material. The floor covering shall closely fit the sidewall in a fully sealed butt joint or extend to the top of the cove.

Floor covering shall be Wood Grain Flooring

TS 75 Interior Lighting

The light source shall be located to minimize windshield glare, with distribution of the light focused primarily on the passengers' reading plane while casting sufficient light onto the advertising display. The lighting system may be designed to form part of or the entire air distribution duct.

Vehicle interior lighting shall be Dinex LED lighting with I/O controls with integral modular advertising panel. The lighting fixtures shall be mounted continuous front to rear on each side of the vehicle, interrupted only as required at doors or drivers area. Lighting shall adequately illuminate the interior and will not interfere or obstruct headroom of a standing passenger. The advertising surface shall be designed for standard 11" high advertising cards. Interior lighting will be on a control switch accessible to the driver.

The lens material shall be translucent polycarbonate. Lenses shall be designed to effectively "mask" the light source. Lenses shall be sealed to inhibit incursion of dust and insects yet be easily removable for service. Access panels shall be provided to allow servicing of components located behind light panels. If necessary, the entire light fixture shall be hinged.

TS 75.1 Passenger

ALTERNATIVE

Dimming Second Row Lights

To help eliminate windshield reflection on suburban roads where street lighting is at a low level, the second light on each side, when "night run" or "night park" is selected, shall be controlled by the switch; off in "off" and on in "normal." These lights shall be turned on at any time if the switch is in the "on" position.

All interior lighting shall be turned off whenever the transmission selector is in reverse and the engine run switch is in the "on" position.

The interior lighting design shall require the approval of the Agency.

DEFAULT

LED lights.

DEFAULT

First Light Modules Dim/Extinguish When Front Door is Closed

When the master switch is in the "run" or "night/run" mode, the first light module on each side of the coach shall automatically extinguish or dim when the front door is in the closed position and illuminate when the door is opened.

TS 75.2 Driver's Area

The driver's area shall have a light to provide general illumination, and it shall illuminate the half of the steering wheel nearest the driver to a level of 5 to 10 foot-candles.

TS 75.3 Seating Areas (Transit Coach)

The interior lighting system shall provide a minimum 15 foot-candle illumination on a 1 sq. ft. plane at an angle of 45 degrees from horizontal, centered 33 in. above the floor and 24 in. in front of the seat back at each seat position. Allowable average light level for the rear bench seats shall be 7 foot-candles.

TS 75.4 Vestibules/Doors (Transit Coach)

Floor surface in the aisles shall be a minimum of 10 foot-candles, and the vestibule area a minimum of 4 foot-candles with the front doors open and a minimum of 2 foot-candles with the front doors closed. The front entrance area and curb lights shall illuminate when the front door is open and master run switch is in the "lights" positions. Rear exit area and curb lights shall illuminate when the rear door is unlocked.

TS 75.5 Step Lighting

Step lighting for the intermediate steps between lower and upper floor levels shall be a minimum of 4 foot-candles and shall illuminate in all engine run positions. The step lighting shall be low profile to minimize tripping and snagging hazards for passengers and shall be shielded as necessary to protect passengers' eyes from glare.

TS 75.6 Ramp Lighting (Transit Coach)

Exterior and interior ramp lighting shall comply with federal regulations.

TS 75.7 Farebox Lighting

TS 75.7.1 Transit Coach

DEFAULT (TC)

Farebox Light

A light fixture shall be mounted in the ceiling above the Farebox location. The fixture shall be capable of projecting a concentrated beam of light on the farebox. This light will automatically come on whenever the front doors are opened and the run switch is in the "night run" or "night park" position.

TS 76 Fare Collection

Space and structural provisions shall be made for installation of a Genfare Fastfare fare box fare collection devices, which shall be as far forward as practicable. Location of the fare collection device shall not restrict traffic in the vestibule, including wheelchairs if a front door loading device is used, and shall allow the driver to easily reach the fare box controls and to view the fare register. The fare box shall not restrict access to the driver area, shall not restrict operation of driver controls and shall not—either by itself or in combination with stanchions, transfer mounting, cutting and punching equipment, or route destination signs—restrict the driver's field of view per SAE Recommended Practice J1050. The location and mounting of the fare collection

device shall allow use, without restriction, by passengers. The fare box location shall permit accessibility to the vault for easy manual removal or attachment of suction devices. Meters and counters on the fare box shall be readable on a daily basis. The floor under the fare box shall be reinforced as necessary to provide a sturdy mounting platform and to prevent shaking of the fare box.

Wiring and a mounting plate for Genfare Fastfare Farebox. Farebox wiring provision shall be installed in the vestibule area just behind the dashboard and to the right of the driver's enclosure. A 12 VDC power wire, 14-gauge, shall be connected to the farebox.. This wire shall include a 20-amp circuit breaker and be connected controlled by battery Charge Guard. The circuit breaker shall be installed in the radio compartment. Additionally, a 14-gauge ground wire shall be provided for the Farebox. A 10 –gauge green wire will be provided as a chassis ground for the Farebox connecting to an approved ground bus bar. Ethernet Cat #6 and 1708 communication cables connected from Farebox to Radio Cabinet. OCU (operator control unit) remote mounted on dash.

Passenger handrail will facilitate installation of the farebox in a manner that allows Maximum clearance in the vestibule for passenger entrance and exit and must meet ADA specifications. The handrail must not interfere with routine maintenance, Cashbox removal on the farebox. The pedestal shall be located so that when the Farebox is installed with the trim units there will be no interference with the dash, handrails, or any other structure.

The farebox shall not obstruct traffic in the vestibule, especially wheelchairs or mobility aids. Manufacturer shall install a Genfare Fastfare Farebox with Trinity Metro software specs. TRIM Version #255 Firmware installed

NOTE: Bidders shall submit drawings showing exact farebox location to be approved by Trinity Metro personnel.

DEFAULT

A GENFARE FASTFARE FAREBOX AND TRIM WITH TRINITY METRO SPECIFIC SOFTWARE IS REQUIRED TO BE PROVIDED AND INSTALLED BY THE AWARDEE

TS 77 Interior Access Panels and Doors (Transit Coach)

Access for maintenance and replacement of equipment shall be provided by panels and doors that appear to be an integral part of the interior. Access doors shall be hinged with gas props or over-center springs, where practical, to hold the doors out of the mechanic's way. Panels shall prevent entry of mechanism lubricant into the bus interior. All fasteners that retain access panels shall be captive in the cover.

TS 78 Floor Panels

Access openings in the floor shall be sealed to prevent entry of fumes and water into the bus interior. Flooring material at or around access openings shall be flush with the floor and shall be edge-bound with stainless steel or another material that is acceptable to the Agency to prevent the edges from coming loose. Access openings shall be asymmetrical so that reinstalled flooring shall be properly aligned. Fasteners shall tighten flush with the floor.

The number of special fastener tools required for panel and access door fasteners shall be minimized.

PASSENGER ACCOMMODATIONS

TS 79 Passenger Seating Arrangements and Seat Style (Commuter Coach)

The passenger seating arrangement in the bus shall be such that seating capacity is maximized and in compliance to the following requirements. Seats shall be Aries 4MA (34" width) or approved equal. All seats shall be upholstered with ¼ inch foam cushion, vinyl only, Seat material will be selected by TRINITY METRO at later time. Ceramic stain guard protection is required.

NOTE: The Agency recognizes that ramp location, foot room, hip-to-knee room, doorway type, width, seat construction, floor level type, seat spacing requirements, ramp or lift, number of wheelchair positions, etc. ultimately affect seating capacity and layout.

DEFAULT

Forward-Facing Seat Configuration:

N/A

ALTERNATIVE

Combination Forward-Facing and Perimeter Seating Arrangement:

Passenger seats shall be arranged in a perimeter seating arrangement.

Rearward Facing Seats (Transit Coach)

DEFAULT

Rearward facing seats not allowed.

TS 79.1 Seat back fitness

ALTERNATIVE

Cushioned backs

Seating and interior trim shall have features to improve passenger comfort. The seat cushion and back shall be padded with a cellular foam product in ¼ inch thickness. Seats, back shall be securely attached and shall be detachable by means of a simple release mechanism so that they are easily removable by the maintenance staff but not by passengers. To the extent practicable, seat cushions and pads shall be interchangeable throughout the bus. Materials shall have high resistance to tearing, flexing and wetting.

TS 79.2 Drain Hole in Seats

DEFAULT

Drain hole provision in seat inserts is required.

TS 79.3 Hip-to-Knee Room

Hip-to-knee room measured from the center of the seating position, from the front of one seat back horizontally across the highest part of the seat to a vertical surface immediately in front, shall be a minimum of 26 in. At all seating positions in paired transverse seats immediately behind other seating positions, hip-to-knee room shall be no less than 27 in.

TS 79.4 Foot Room

Foot room, measured at the floor forward from a point vertically below the front of the seat cushion, shall be no less than 14 in. Seats immediately behind the wheel housings and modesty panels may have foot room reduced.

TS 79.5 Aisles (Transit Coach)

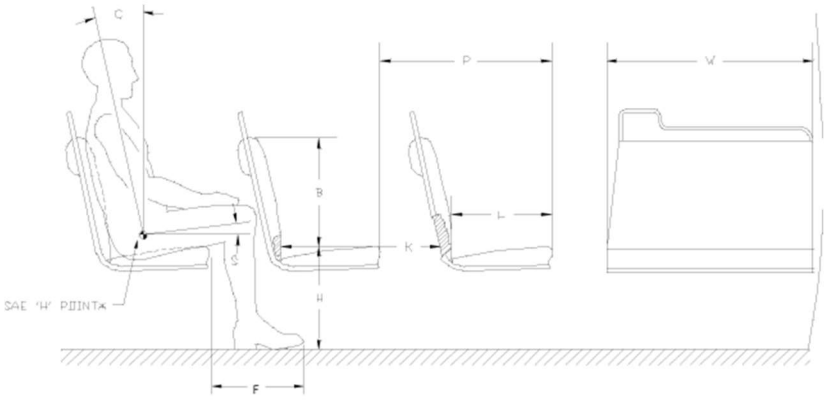
The aisle between the seats shall be no less than 20 in. wide at seated passenger hip height. Seat backs shall be shaped to increase this dimension to no less than 24 in. at 32 in. above the floor (standing passenger hip height).

The aisle between the seats shall be no less than 14 in. wide at seated passenger hip height.

TS 79.6 Dimensions (Transit Coach)

FIGURE 6

Seating Dimensions and Standard Configuration



DEFAULT

Seat dimensions for the various seating arrangements shall have the dimensions as follows (refer to **Figure 6**):

- The width, W, of the two-passenger transverse seat shall be a minimum 35 in.
- The length, L, shall be 17 in., ±1 in.
- The seat back height, B, shall be a minimum of 15 in.
- The seat height, H, shall be 17 in., ± 1 in. For the rear lounge (or settee) and longitudinal seats, and seats located above raised areas for storage of under-floor components, a cushion height of up to 18 in., ±2 in., will be allowed. This shall also be allowed for limited transverse seats, but only with the expressed approval of the Agency.
- Foot room = F.
- The seat cushion slope, S, shall be between 5 and 11 deg.
- The seat back slope, C, shall be between 8 and 17 deg.
- Hip to knee room = K.
- The pitch, P, is shown as reference only.

ALTERNATIVE

Agency to specify seat dimensions.

TS 79.6.1 Structure and Design (Transit Coach)

The passenger seat frame and its supporting structure shall be constructed and mounted so that space under the seat is maximized and is completely free of obstructions to facilitate cleaning.

Seats, structures and restraints around the securement area should not infringe into the mobility device envelope or maneuverability.

The transverse seat structure shall be fully cantilevered from the sidewall with sufficient strength for the intended service. The lowest part of the seat assembly that is within 12 in. of the aisle shall be at least 10 in. above the floor.

In locations at which cantilevered installation is precluded by design and/or structure, other seat mounting may be allowed.

All transverse objects—including seat backs, modesty panels, and longitudinal seats—in front of forward-facing seats shall not impart a compressive load in excess of 1000lbs onto the femur of passengers ranging in size from a 5th-percentile female to a 95th-percentile male during a 10g deceleration of the bus. This deceleration shall peak at 0.05 to0.015 seconds from initiation. Permanent deformation of the seat resulting from two 95th-percentile males striking the seat back during this 10g deceleration shall not exceed 2 in., measured at the aisle side of the seat frame at height H. The seat back should not deflect more than 14 in., measured at the top of the seat back, in a controlled manner to minimize passenger injury. Structural failure of any part of the seat or sidewall shall not introduce a laceration hazard.

The seat assembly shall withstand static vertical forces of 500 lbs. applied to the top of the seat cushion in each seating position with less than ¼in. permanent deformation in the seat or its mountings. The seat assembly shall withstand static horizontal forces of 500 lbs. evenly distributed along the top of the seat back with less than ¼in. permanent deformation in the seat or

its mountings. The seat backs at the aisle position and at the window position shall withstand repeated impacts of two 40-lb sandbags without visible deterioration. One sandbag shall strike the front 40,000 times and the other sandbag shall strike the rear 40,000 times. Each sandbag shall be suspended on a 36in. pendulum and shall strike the seat back 10,000 times each from distances of 6, 8, 10 and 12 in. Seats at both seating positions shall withstand 4000 vertical drops of a 40-lb sandbag without visible deterioration. The sandbag shall be dropped 1000 times each from heights of 6, 8, 10 and 12 in. Seat cushions shall withstand 100,000 randomly positioned 3½ in. drops of a squirming, 150-lb, smooth-surfaced, buttocks-shaped striker with only minimal wear on the seat covering and no failures to seat structure or cushion suspension components.

The back of each transverse seat shall incorporate a handhold no less than ⅞ in. in diameter for standees and seat access/egress. The handhold shall not be a safety hazard during severe decelerations. The handhold shall extend above the seat back near the aisle so that standees shall have a convenient vertical assist, no less than 4 in. long that may be grasped with the full hand. This handhold shall not cause a standee using this assist to interfere with a seated 50th-percentile male passenger. The handhold shall also be usable by a 5th-percentile female, as well as by larger passengers, to assist with seat access/egress for either transverse seating position. The upper rear portion of the seat back and the seat back handhold immediately forward of transverse seats shall be padded and/or constructed of energy-absorbing materials. During a 10g deceleration of the bus, the HIC number (as defined by SAE Standard J211a) shall not exceed 400 for passengers ranging in size from a 5th percentile female through a 95th percentile male.

The seat back handhold may be deleted from seats that do not have another transverse seat directly behind and where a vertical assist is provided.

Longitudinal seats shall be the same general design as transverse seats but without seat back handholds. Longitudinal seats may be mounted on the wheelhouses. Armrests shall be included on the ends of each set of longitudinal seats except on the forward end of a seat set that is immediately to the rear of a transverse seat, the driver's barrier, or a modesty panel, when these fixtures perform the function of restraining passengers from sliding forward off the seat. Armrests are not required on longitudinal seats located in the wheelchair parking area that fold up when the armrest on the adjacent fixed longitudinal seat is within 3½ in. of the end of the seat cushion. Armrests shall be located from 7 to 9 in. above the seat cushion surface. The area between the armrest and the seat cushion shall be closed by a barrier or panel. The top and sides of the armrests shall have a minimum width of 1 in. and shall be free from sharp protrusions that form a safety hazard.

Seat back handhold and armrests shall withstand static horizontal and vertical forces of 250 lbs. applied anywhere along their length with less than ¼ in. permanent deformation. Seat back handhold and armrests shall withstand 25,000 impacts in each direction of a horizontal force of 125 lbs. with less than ¼in. permanent deformation and without visible deterioration.

TS 79.1.2 Construction and Materials (Transit Coach)

Selected materials shall minimize damage from vandalism and shall reduce cleaning time. The seats shall be attached to the frame with tamper-resistant fasteners. Coloring shall be consistent throughout the seat material, with no visually exposed portion painted. Any exposed metal touching the sides or the floor of the bus shall be stainless steel. The seat, pads and cushions shall be contoured for individuality, lateral support and maximum comfort and shall fit the framework to reduce exposed edges.

The minimum radius of any part of the seat back, handhold or modesty panel in the head or chest impact zone shall be a nominal ¼in.The seat back and seat back handhold immediately forward of transverse seats shall be constructed of energy-absorbing materials to provide passenger protection and, in a severe crash, to allow the passenger to deform the seating materials in the impact areas. Complete seat assemblies shall be interchangeable to the extent practicable.

TS 80 Passenger Assists (Transit Coach)

Passenger assists in the form of full grip, vertical stanchions or handholds shall be provided for the safety of standees and for ingress/egress. Passenger assists shall be convenient in location, shape and size for both the 95th-percentile male and the 5th-percentile female standee. Starting from the entrance door and moving anywhere in the bus and out the exit door, a vertical assist shall be provided either as the vertical portion of the seat back assist or as a separate item so that a 5th-percentile female passenger may easily move from one assist to another using one hand and the other without losing support. All handholds and stanchions at the front doorway, around the farebox, and at interior steps for bi-level designs shall be powder-coated in a high-contrast yellow color.

ALTERNATIVE

The forward-most vertical stanchions on either side of the aisle immediately behind the driver's area shall be stainless steel finish.

TS 80.1 Assists (Transit Coach)

Excluding those mounted on the seats and doors, the assists shall have a cross-sectional diameter between 1¼ and 1½ in. or shall provide an equivalent gripping surface with no corner radii less than ¼ in. All passenger assists shall permit a full hand grip with no less than 1½ in. of knuckle clearance around the assist. Passenger assists shall be designed to minimize catching or snagging of clothes or personal items and shall be capable of passing the NHTSA Drawstring Test.

Any joints in the assist structure shall be underneath supporting brackets and securely clamped to prevent passengers from moving or twisting the assists. Seat handholds may be of the same construction and finish as the seat frame. Door-mounted passenger assists shall be of anodized aluminum, stainless steel or powder-coated metal. Connecting tees and angles may be powder-coated metal castings. Assists shall withstand a force of 300 lbs. applied over a 12in. lineal dimension in any direction normal to the assist without permanent visible deformation. All passenger assist components, including brackets, clamps, screw heads and other fasteners used on the passenger assists shall be designed to eliminate pinching, snagging and cutting hazards and shall be free from burrs or rough edges.

TS 80.2 Front Doorway

Front doors, or the entry area, shall be fitted with ADA-compliant assists. Assists shall be as far outward as practicable, but shall be located no farther inboard than 6 in. from the outside edge of the entrance step and shall be easily grasped by a 5th-percentile female boarding from street level. Door assists shall be functionally continuous with the horizontal front passenger assist and the vertical assist and the assists on the wheel housing or on the front modesty panel.

TS 80.3 Vestibule (Transit Coach)

The aisle side of the driver's barrier, the wheel housings and when applicable the modesty panels shall be fitted with vertical passenger assists that are functionally continuous with the overhead assist and that extend to within 36 in. of the floor. These assists shall have sufficient clearance from the barrier to prevent inadvertent wedging of a passenger's arm.

A horizontal passenger assist shall be located across the front of the bus and shall prevent passengers from sustaining injuries on the fare collection device or windshield in the event of a sudden deceleration. Without restricting the vestibule space, the assist shall provide support for a boarding passenger from the front door through the fare collection procedure. The assist shall be no less than 36 in. above the floor. The assists at the front of the bus shall be arranged to permit a 5th-percentile female passenger to easily reach from the door assist, to the front assist, to vertical assists on the driver's barrier, wheel housings or front modesty panel.

TS 80.4 Rear Doorway(s) (Transit Coach)

Vertical assists that are functionally continuous with the overhead assist shall be provided at the aisle side of the transverse seat immediately forward of the rear door and on the aisle side of the rear door modesty panel(s).Passenger assists shall be provided on modesty panels that are functionally continuous with the rear door assists. Rear doors, or the exit area, shall be fitted with assists having a cross-sectional diameter between 1¼ and 1½ in. or providing an equivalent gripping surface with no corner radii less than ¼ in., and shall provide at least 1½ in. of knuckle clearance between the assists and their mounting. The assists shall be designed to permit a 5th-percentile female to easily move from one assist to another during the entire exiting process. The assists shall be located no farther inboard than 6 in. from the outside edge of the rear doorway step.

NOTE: **For an articulated bus, passenger assists will be provided to aid in the transition between the front and rear sections of the bus.**

TS 80.5 Overhead (Transit Coach)

Except forward of the standee line and at the rear door, a continuous, full-grip, overhead assist shall be provided. This assist shall be located over the center of the aisle seating position of the transverse seats. The assist shall be no less than 70 in. above the floor.

ALTERNATIVE

Grab straps or other extensions as necessary shall be provided for sections where vertical assists are not available and for use by passengers that cannot reach to 70 in.

ALTERNATIVE

Grip straps shall be nylon.

Overhead assists shall simultaneously support 150 lbs. on any 12in. length. No more than 5 percent of the full grip feature shall be lost due to assist supports.

TS 80.6 Longitudinal Seat Assists (Transit Coach)

Longitudinal seats shall have vertical assists located between every other designated seating position, except for seats that fold/flip up to accommodate wheelchair securement. Assists shall extend from near the leading edge of the seat and shall be functionally continuous with the overhead assist Assists shall be staggered across the aisle from each other where practicable and shall be no more than 52 in. apart or functionally continuous for a 5th percentile female passenger.

TS 80.7 Wheel Housing Barriers/Assists (Transit Coach)

Unless passenger seating is provided on top of wheel housings, passenger assists shall be mounted around the exposed sides of the wheel housings (and propulsion compartments if applicable), which shall also be designed to prevent passengers from sitting on wheel housings. Such passenger assists shall also effectively retain items, such as bags and luggage, placed on top of wheel housings.

TS 81 Passenger Doors

TS 81.1 Transit Coach

Doorways will be provided in the locations and styles as follows. Passenger doors and doorways shall comply with ADA requirements.

TS 81.1.1 Front door

DEFAULT

Door shall be forward of the front wheels and under direct observation of the driver. All doors shall be electrically controlled when operated and will function electronically. All doors shall be all electrically operated by Vapor doors.

TS 81.1.2 Rear Door(s)

ALTERNATIVE

Curbside doorway centerline located rearward of the point midway between the front door centerline and the rearmost seat back.

TS 81.2 Materials and Construction

Structure of the doors, their attachments, inside and outside trim panels and any mechanism exposed to the elements shall be corrosion resistant. Door panel construction shall be of corrosion-resistant metal or reinforced non-metallic composite materials. When fully opened, the doors shall provide a firm support and shall not be damaged if used as an assist by passengers during ingress or egress. Door edges shall be sealed to prevent infiltration of exterior moisture, noise, dirt and air elements from entering the passenger compartment, to the maximum extent possible based on door types.

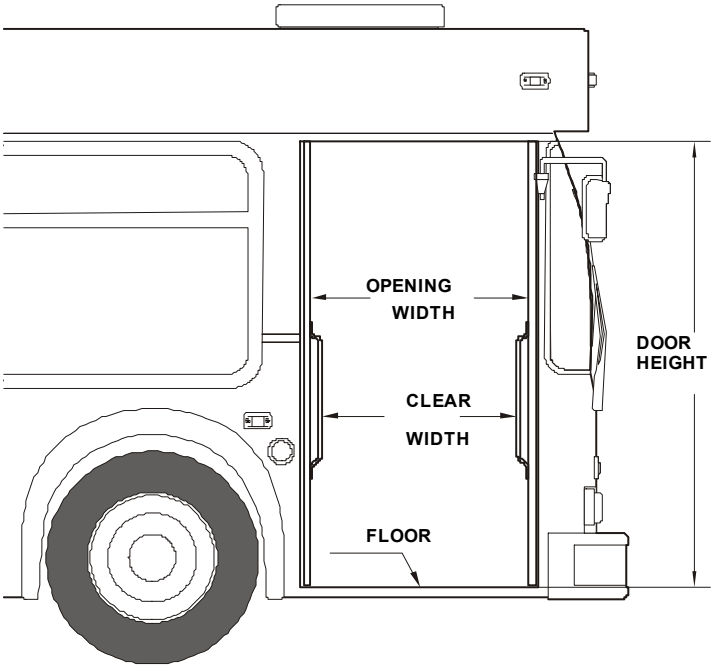
The closing edge of each door panel shall have no less than 2 in. of soft weather stripping. The doors, when closed, shall be effectively sealed, and the hard surfaces of the doors shall be at least

4 in. apart (not applicable to single doors).The combined weather seal and window glazing elements of the front door shall not exceed 10 deg of binocular obstruction of the driver's view through the closed door.

TS 81.3 Dimensions

TS 81.3.1 Transit Coach

FIGURE 7
Transit Bus Minimum Door Opening



When open, the doors shall leave an opening no less than 75 in. in height.

ALTERNATIVE

Doorway Clear Width Greater than 31¾ in.

The front door clear width shall be a minimum of [36] in. with the doors fully opened. The rear door clear width shall be a minimum of [32] in. with the doors fully opened.

If the Agency requires a minimum rear door clear width of 31¾ in. or greater and an outward opening (swing) door is specified, then the maximum outboard excursion of 13 in. may be exceeded.

Commuter Coach

Standard

TS 81.4 Door Glazing

The upper section of both front and rear doors shall be glazed for no less than 45 percent of the respective door opening area of each section. The lower section of the front door shall be glazed for no less than 25 percent of the door opening area of the section.

Door glazing shall be easily replaceable.

ALTERNATIVE

The front door panel glazing material shall be Safety Glass with ThermoGuard BlueSpruce

TS 81.5 Door Projection (Transit Coach)

TS 81.5.1 Exterior

The exterior projection of the front doors beyond the side of the bus shall be minimized and shall not block the line of sight of the rear exit door via the curb side mirror when the doors are fully open. The exterior projection of both doors shall be minimized and shall not exceed 14 in. during the opening or closing cycles or when doors are fully opened

TS 81.5.2 Interior

Projection inside the bus shall not cause an obstruction of the rear door mirror or cause a hazard for standees.

TS 81.6 Door Height Above Pavement

It shall be possible to open and close either passenger door when the bus loaded to gross vehicle weight rating is not knelt and parked with the tires touching an 8in. high curb on a street sloping toward the curb so that the street-side wheels are 5 in. higher than the right-side wheels.

TS 81.7 Closing Force

Closing door edge speed shall not exceed 12 in. per second, and opening door speed shall not exceed 19 in. per second. Power doors shall not slam closed under any circumstance, even if the door is obstructed during the closing cycle. If a door is obstructed during the closing cycle, the pressure exerted on the obstruction shall not increase once initial contact has been made.

Doors closed by a return spring or counterweight-type device shall be equipped with an obstruction-sensing device that, at a minimum, alerts the driver if an obstruction is detected between the closing doors. Doors closed by a return spring or counterweight type device, when unlocked, shall be capable of being pushed to the point where the door starts to open with a force not to exceed 25 lbs applied to the center edge of the forward door panel.

Whether or not the obstruction-sensing system is present or functional, it shall be possible to withdraw a 1½ in. diameter cylinder from between the center edges of a closed and locked door with an outward force not greater than 35 lbs.

TS 81.8 Rear Door Closing Force (Transit Coach)

Power-close rear doors shall be equipped with an obstruction-sensing system such that if an obstruction is within the path of the closing doors, the doors will stop and/or reverse direction

prior to imparting a 10-lb force on 1 sq. in. of that obstruction. If a contactless obstruction sensing system is employed, it shall be capable of discriminating between the normal doorway environment and passengers or other obstructions within the doorway, and of altering the zones of detection based upon the operating state of the door system.

TS 81.9 Actuators

Doors shall open or close completely in not more than 3.5 seconds from the time of control actuation and shall be subject to the closing force requirements.

Door actuators shall be adjustable so that the door opening and closing speeds can be independently adjustable to satisfy the above requirements. Actuators and the complex door mechanism shall be concealed from passengers but shall be easily accessible for servicing. The door actuators shall be re-buildable. If powered by compressed air, exhaust from the door system shall be routed below the floor of the bus to prevent accumulation of any oil that may be present in the air system and to muffle sound.

Door actuators and associated linkages shall maximize door holding forces in the fully open and fully closed positions to provide firm, non-rattling, non-fluttering door panels while minimizing the force exerted by the doors on an obstruction midway between the fully open and closed positions.

ALTERNATIVE

The rear doors shall be passenger-controlled. The vehicle operator shall unlock and enable the opening mechanism, which shall be annunciated by illumination of a green light near the door. After enabling and unlocking, the doors shall be opened by either the passenger manually pushing the door open, or by a powered mechanism actuated by passenger activation of a touch bar or touch switch. A switch located within reach of the seated operator shall, when actuated, restore rear door function to complete operator control, as described in the Default.

Doors that employ a “swing” or pantograph geometry and/or are closed by a return spring or counterweight-type device shall be equipped with a positive mechanical holding device that automatically engages and prevents the actuation mechanism from being back-driven from the fully closed position. The holding device shall be overcome only when the driver’s door control is moved to an “Exit Door Enable” position and the vehicle is moving at a speed of less than 2 mph, or in the event of actuation of the emergency door release.

Locked doors shall require a force of more than 300 lbs. to open manually. When the locked doors are manually forced to open, damage shall be limited to the bending of minor door linkage with no resulting damage to the doors, actuators or complex mechanism.

The nominal door opening and closing speed shall be in the 3–5 second range. The maximum door opening and closing speeds will be regulated using fixed, maintenance free orifices and airline sizes. If required, door speeds can be decreased with the addition of a flow-restricting device. Actuators and the complete door mechanism shall be concealed from passengers but shall be easily accessible for servicing.

TS 81.9.1 Rear Door Interlocks (Transit Coach)

Rear exit door operation shall be integrated with a brake interlock circuit. When doors open, rear brakes shall be applied to preclude any movement of the vehicle while passengers are boarding or departing. A green light/s shall be provided, mounted above or either side of the door panels, alerting the passengers that the exit door may now be opened by pushing on the grab handles.

TS 81.9.2 Emergency Operation

In the event of an emergency, it shall be possible to manually open doors designated as emergency exits from inside the bus using a force of no more than 25 lbs. after actuating an unlocking device. The unlocking device shall be clearly marked as an emergency-only device and shall require two distinct actions to actuate. The respective door emergency unlocking device shall be accessible from the doorway area. The unlocking device shall be easily reset by the operator without special tools or opening the door mechanism enclosure. Doors that are required to be classified as "emergency exits" shall meet the requirements of FMVSS 217.

TS 82 Door Control

The door control shall be located in the operator's area within the hand reach envelope described in SAE Recommended Practice J287, "Driver Hand Control Reach." The driver's door control shall provide tactile feedback to indicate commanded door position and resist inadvertent door actuation.

DEFAULT

Door control located on street side.

DEFAULT

The front door shall remain in commanded state position even if power is removed or lost.

TS 82.1 Door Controller

TS 82.1.1 Transit Coach

DEFAULT

Five-Position Driver's Door Controller

The control device shall be protected from moisture. Mounting and location of the door control device handle shall be designed so that it is within comfortable, easy arm's reach of the seated driver. The door control device handle shall be free from interference by other equipment and have adequate clearance so as not to create a pinching hazard.

Position of the door control handle shall result in the following operation of the front and rear doors:

- **Center position:** Front door closed, rear door(s) closed or set to lock.
- **First position forward:** Front door open, rear door(s) closed or set to lock.
- **Second position forward:** Front door open, rear door(s) open or set to open.
- **First position back:** Front door closed, rear door(s) open or set to open.
- **Second position back:** Front door open, rear door(s) open or set to open.

TS 82.1.2 Commuter Coach

Doors shall be operated by push-button controls, conveniently located and operable within the driver's reach. The push buttons shall be labeled. Also from the curbside exterior.

TS 82.2 Door Open/Close

ALTERNATIVE (TC)

Operator-Controlled Front and Passenger-Controlled Rear Doors with Provision for Driver Override

Operation of, and power to, the front passenger doors shall be completely controlled by the operator. Power to rear doors shall be controlled by the operator. After enabling, the rear doors shall be opened by the passenger. A switch shall be provided to enable the driver to obtain full control of the rear doors.

DEFAULT

A control or valve in the operator's compartment shall shut off the power to, and/or dump the power from, the front door mechanism to permit manual operation of the front door with the bus shut down. A master door switch, which is not within reach of the seated operator, when set in the "off" position shall close the rear/center doors (if applicable), deactivate the door control system, release the interlocks and permit only manual operation of the rear/center doors.

TS 82.3 Accessibility Provisions

Space and body structural provisions shall be provided at the front or rear door of the bus to accommodate a wheelchair loading system.

TS 83 Loading Systems

There is one option:

- **low-floor ramp**

TS 83.1 Lift

Show Options

TS 83.2 Loading System for 30 to 60ft Low-Floor Bus

An automatically controlled, power-operated ramp system compliant to requirements defined in 49 CFR Part 38, Subpart B, §38.23c shall provide ingress and egress quickly, safely and comfortably, both in forward and rearward directions, for a passenger in a wheelchair from a level street or curb.

DEFAULT

Front Door Location of Loading System, Flip-Out Design Ramp with 6:1 Slope

The wheelchair loading system shall be located at the front door, with the ramp being of a simple hinged, flip-out type design being capable of deploying to the ground at a maximum 6:1 slope.

TS 83.3 Wheelchair Accommodations

The two-wheelchair securement and occupant restraint systems shall be the Q'straint, WF-Q'POD Street Side,WC Barrier Integrated With 3 Passenger Flip-Up Seat With Remote Release anchorage consisting of the self-tensioning, self-locking features on retractors, without tightening knobs. Note: If knobs are required for operation of the system being offered, it shall be indicated at time of bid submission. The retractors shall have the maximum amount of gray, 7000 pound webbing attached to the large Transit "J" hooks..

DEFAULT

Two Forward-Facing Wheelchair Securement Locations

Two forward-facing locations, as close to the wheelchair loading system as practical, shall provide parking space and securement system compliant with ADA requirements for a passenger in a wheelchair.

TS 83.3.1 Interior Circulation

Maneuvering room inside the bus shall accommodate easy travel for a passenger in a wheelchair from the loading device and from the designated securement area. It shall be designed so that no portion of the wheelchair protrudes into the aisle of the bus when parked in the designated parking space(s). When the positions are fully utilized, an aisle space of no less than 20 in. shall be maintained. As a guide, no width dimension should be less than 34 in. Areas requiring 90deg turns of wheelchairs should have a clearance arc dimension no less than 45 in., and in the parking area where 180deg turns are expected, space should be clear in a full 60in.diameter circle. A vertical clearance of 12in. above the floor surface should be provided on the outside of turning areas for wheelchair footrests.

SIGNAGE AND COMMUNICATION

TS 84 Destination Signs

DEFAULT

A destination sign system shall be furnished on the front, on the right side near the front door and one on the rear of coach

An electronic destination sign system shall be supplied for the front and side and rear of the vehicle. The sign must meet all ADA requirements. The destination sign shall be the latest system using amber LED's. Wiring for rear route sign shall be provided and secured in the rear of the vehicle away from any heat source. Sign shall be latest design of Luminator or approved equal. Preferred warranty to be life of vehicle, twelve (12) years.

ALTERNATIVE

Route sign on the rear of the vehicle is required.

ALTERNATIVE

Street and Curb Side Route Sign

The sign located near the front door shall not block the driver's critical horizontal line of sight. Display areas of destination signs shall be clearly visible in direct sunlight and/or at night.

All signs shall be controlled via a single human-machine interface (HMI). In the absence of a single mobile data terminal (MDT), the HMI shall be conveniently located for the bus driver within reach of the seated driver.

ALTERNATIVE

The sign shall not be located within reach of the seated driver.

DEFAULT

The destination sign compartments shall meet the following minimum requirements:

- Compartments shall be designed to prevent condensation and entry of moisture and dirt.
- Compartments shall be designed to prevent fogging of both compartment window and glazing on the unit itself.
- Access shall be provided to allow cleaning of inside compartment window and unit glazing.
- The front window shall have an exterior display area of no less than 8.5 in. high by 56 in. wide.

ALTERNATIVE

Rear Run number sign shall be installed.

TS 85 Passenger Information and Advertising (Transit Coach)

TS 85.1 Interior Displays

Provisions shall be made on the rear of the driver's barrier or equipment box located on the wheel well for a frame to retain information such as routes and schedules.

Advertising media 11 in. high and 0.09 in. thick shall be retained near the juncture of the bus ceiling and sidewall. The retainers may be concave and shall support the media without adhesives. The media shall be illuminated by the interior light system.

TS 86 Passenger Stop Request/Exit Signal

TS 86.1 Transit Coach

DEFAULT

Use for Touch Tape Passenger Signal

A passenger "stop requested" signal system that complies with applicable ADA requirements defined in 49 CFR, Part 38.37, shall be provided. The system shall consist of a pull cord, chime and a interior sign message. The pull cord shall be yellow in color and accessible to all seated passengers, with provisions for standees. It shall be easily accessible to all passengers, seated or standing.

TS 86.2 Signal Chime

DEFAULT

A single "stop requested" chime shall sound when the system is first activated. A double chime shall sound anytime the system is activated from wheelchair passenger areas.

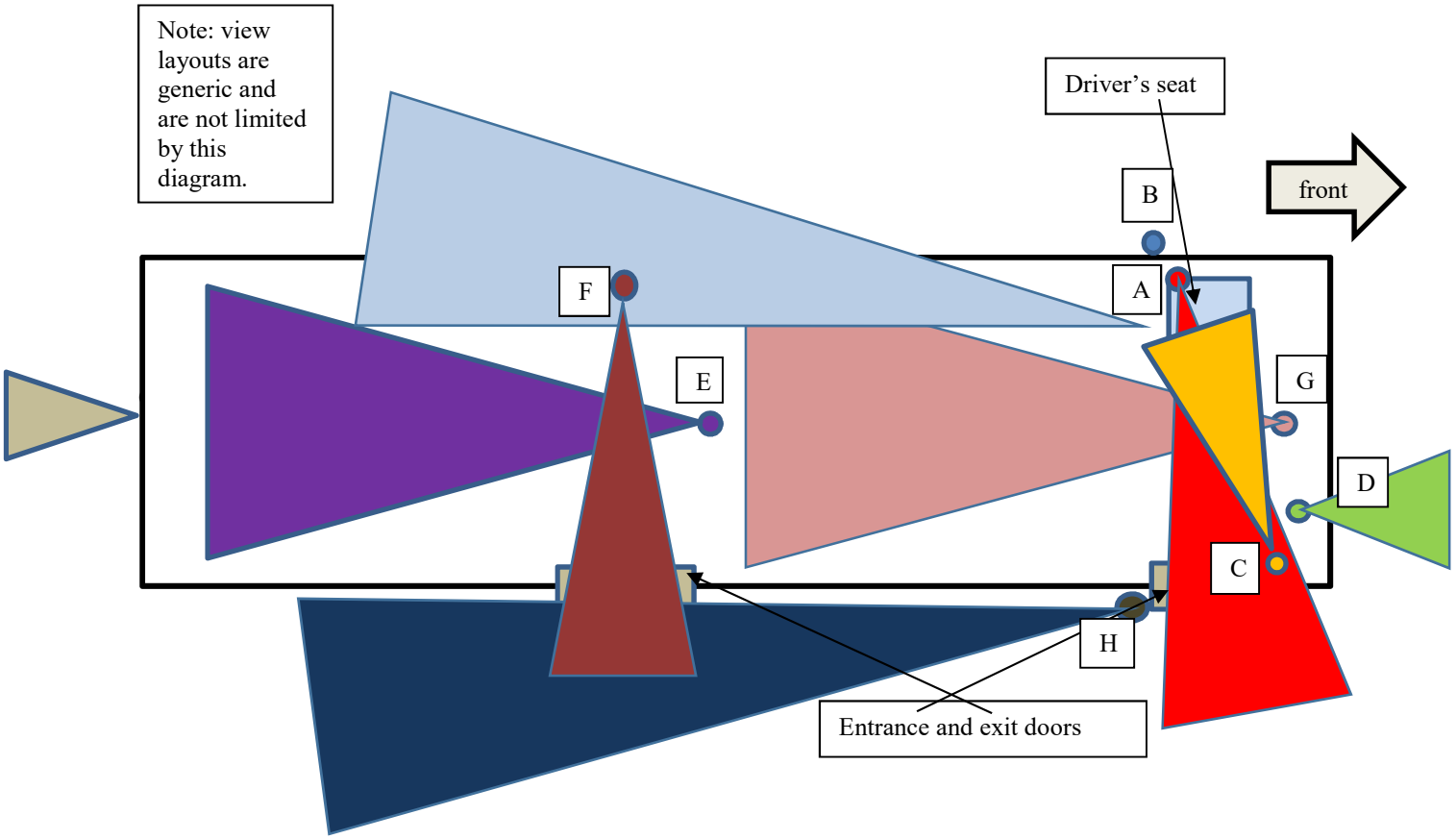
Exit signals located in the wheelchair passenger area shall be no higher than 4 ft. above the floor. Instructions shall be provided to clearly indicate function and operation of these signals.

TS 87 Communications

A Motorola APX 6500 Mobile Radio with the program Template from MCA Communications (APX6500 Vontas ITS) will be provided and installed by awardee Radio Brick to be mounted in the Radio Storage Box

TS 87.1 Camera Surveillance System

A PREF-TECH Genetech Server Camera System shall be installed by awardee, including battery back up. Provide all wiring and mounting locations for a multi-camera IP Ethernet camera surveillance system cameras, recorder, microphone, etc. Agency to specify the camera system cable to be installed, the locations for pre-wiring and the quantity. Conduit shall be 1" and all cables shall be installed in Nine (9) locations throughout the vehicle in order to facilitate installation of nine cameras, utilizing appropriate mounting devices.



TS 87.2 Public Address System

A public address system shall be provided on each bus for facilitating radio system and driver-originated announcements to passengers. System shall be Driver Master Vontas with microphone. A foot switch operated to the left of the operator's foot area shall be provided for activating for inside announcements. Intercom system with internal and external speaker shall be provide in order for the operator to announce destinations to boarding passengers.

TS 87.2.1 AVA, Automatic Voice Annunciator

DEFAULT

Trinity Metro requires an AVA system, Drive Master by Vontas to be installed.

TS 87.2.2 Interior passenger display

DEFAULT

Through the use of the Vontas system a interior display sign shall be installed in the front header area visable to passengers for trip information.

TS 87.2.3 Passenger information system

DEFAULT

The contractor shall install a passenger information system. Vontas Transit Master ITS system shall be installed with all hard ware and software to enable the system to be fully functional to the authority upon delivery of the vehicle. This includes any GPS for AVL or automatic vehicle locator capabilities and information.

TS 87.2.4 Speakers

DEFAULT

Eight interior loudspeakers shall be provided, semi-flush mounted, on alternate sides of the bus passenger compartment, installed with proper phasing. Total impedance seen at the input connecting end shall be 8 Ohms. Mounting shall be accomplished with riv-nuts and machine screws.

TS 87.2.5 CAD/AVL

DEFAULT

A CAD/AVL system is to be provided and installed. A Vontas Transit Master ITS system is required

TS 88 Automatic Passenger Counter (APC)

DEFAULT

The APC system to be installed shall be of the Irma manufacturer. Which is part of the Vontas Transit Master ITS system

TS 89 Radio Handset and Control System

TS 89.1 Drivers Speaker

Each bus shall have a recessed speaker in the ceiling panel above the driver. This speaker shall be the same component used for the speakers in the passenger compartment. It shall have 8 Ohms of impedance.

TS 89.2 Handset

Contractor will install a handset for driver use this Handset needs to work with Vontas Transit Master ITS system.

TS 89.3 Driver Display Unit (DDU)

Contractor shall install a driver display unit as close to the driver's instrument panel as possible. Vontas Transit Master ITS system.

TS 89.4 Emergency Alarm

Contractor shall install an emergency alarm that is accessible to the driver but hidden from view.

An area shall be provided to accommodate communications equipment. A radio Compartment shall be supplied with 40-amp, 12 VDC, battery power, protected service with positive and negative leads. An additional 10-gauge ignition sense wire will also be supplied in the radio compartment. Within the electrical compartment terminal strips will be provided for each of the following:

24V battery power constant; 12V battery power constant, with both of these having primary leads capable of sustaining 60 amps of load, also a 12V Ignition lead, and 24V Ignition supply using 12-gauge wire. The ground wire should also sustain 60 amps loading. A covert alarm switch by OTTO (part# P4-900019) wired normally open with a Deustch 12V 8 pin connector shall be installed on the left console in a manner that it may be actuated without any noticeable movement of the operator. A two-conductor wire, 18-gauge stranded, Belden or Alpha grade PVC jacketed, is to be run from the switch to the radio box. The radio compartment will be located in the interior of the vehicle and shall be heated, cooled, and vented. It shall be constructed of 0.145-gauge minimum thickness aluminum measuring 40" tall by 24" wide by 30" deep and be secured at the top and bottom for no movement. It shall contain a quantity of 4 - ¼" aluminum shelves (no wood) and each shelf will be supported on heavy duty slide rails capable of supporting 50 lbs. each. The access door will have a key lock. The interior shall provide access to install wires from box to ceiling duct and at the bottom of the box to the driver's electrical panel.

A Sierra MG 90 5G: 1104708 (Single 4×4), 1104709 (Dual 2×2) wireless router with cellular capability with two exterior antennas is to be provided and install in the radio cabinet by awardee. Both antennas are to be mounted 18" to 20" apart and any other obstacle and connected to router. A 5" or 6" flush mount, round, marine-type access panel will be installed on the interior of the vehicle which will allow access to the connection on the roof mounted antennas.

A conduit specifically for the radio measuring – 1" - with antenna pull wires shall be Installed from the radio compartment to the roof-mounted antenna. Conduit specifications for camera systems are listed in another section of these specifications. Conduit with antenna coax shall be installed from the radio compartment to the roof-mounted antenna. The coax shall be Times Microwave Systems, 1/4" LMR-240'cable and coax connectors shall be BNC at the antenna. The antenna mounting and lead termination shall be the responsibility of the manufacturer and must be accessible from the vehicle interior. The antenna shall be an SRLP- SB-CEL, available from STI-CO with the connector for the coax at the radio in the radio box being TMC-TC-240-

MUHF. A 5" or 6" flush mount, round, marine-type access panel will be installed on the interior of the vehicle which will allow access to the connection on the roof mounted antenna. The antenna shall be mounted near the left front of the vehicle and shall be no closer than 3' feet to any other antenna, wireless device.

A representative from Trinity Metro will be available to determine mounting location of all radio equipment, headset and related hardware. The Manufacturer will be responsible for providing and installation of the system during production.

A Motorola APX 6500 Mobile Radio with the program Template from MCA Communications (APX6500 Vontas ITS) will be provided and installed by awardee

TS 90 Event Data Recorders (EDR)

ALTERNATIVE

TS 91 Vehicle Charging Requirements

TS 91.1 Plug-In Charging

The coach must be able to charge with a commercially available plug-in charger that uses the SAE J1772 CCS standard charging protocol. Coach will be required to have a charging port on both street and curb side.

TS 91.2 On-Route Charging (Options)

The coach must be able to automatically connect or electrically couple to an on-route overhead fast-charging system with minimal driver intervention and automatically disconnect when charging is complete or commanded by the operator. The bus shall be able charge at rates in excess of 350kW each trip in order to replenish the energy consumed. Fully charging the Energy Storage System must take less than twelve (12) minutes on average.

TS 91.3 Infrastructure

The proposer will provide a quote for a turnkey infrastructure to be built and installed on Trinity Metro property at 1601 E El Paso, Fort Worth, TX 76102. This quote will include all that is required from start to finish "TURN KEY" infrastructure charging system with weather protective structures, i.e. canopy, covered awning, etc. The infrastructure will allow for parallel charging and connection of Six buses – allowing at least three buses to charge simultaneously. Once all SIX vehicles are charged, vehicles will trickle charge to maintain charge. Proposer is responsible for all research regarding adequacy of existing infrastructure and costs for any upgrades required. Proposer will be responsible for all required permits, working with city, government, and local electric providers, including all

costs associated with same. Proposer is responsible for all costs associated with Copies of any surveys, ground penetrating radar or other investigative reports will be provided to Trinity Metro.

During construction, successful Proposer will be responsible for complying with all of the requirements of is responsible for keeping a clean work environment, providing portable restrooms for construction crews, barricading the work area, removing all construction debris and coordinating with Trinity Metro regarding safety and construction protocols. Proposer is responsible for providing their own equipment. This includes, but is not limited to, dumpsters, forklifts, scissor lifts, shovels, etc. Any power outages will need to be coordinated outside of Trinity Metro's peak hours of operations. If concrete is disturbed, replacement concrete must meet Trinity Metro's current specifications.

TS 92 Approved Equals

Table 8 lists products that have been approved for the bus procurement. The list contains products that are of interest to the Agency and is not intended to be a comprehensive listing of every product required for the manufacture of the subject buses. Product categories not listed are left to the discretion of the Contractor so long as the product complies with the specifications. Product specification information is for reference only and may not reflect the latest or future improvements by manufacturers. Any change, revision or substitution of specified products requires approval .of the agency. To add to or revise this list, Contractor must submit a written request per the Specification by the due date found in the RFP for approved equals.

NOTE: Transit agencies are encouraged to list as many suppliers as possible.

TABLE 8
Approved Equals Products

Product	Manufacturer	Product Specification

SECTION 6 DETAILED SUBMITTAL REQUIREMENTS

Proposers shall assemble their proposals in strict adherence to the layout requirements identified in this section. Failure to follow all proposal layout requirements may result in disqualification. Proposals shall be prepared as simply as possible and provide a straightforward, concise description of the proposed products and services to satisfy the requirements of the RFP. Attention shall be given to accuracy, completeness, relevance, and clarity of content. Proposals shall address the following questions and contain the following three parts.

1. **Forms – 12 Forms (F1 through F12) in Section 10**
2. **Technical – 6 Sections**
3. **Financial – Payment Schedule, and Financial (if mailed in, ensure submit in a separate sealed envelope)**

1. Price Proposal

Proposers shall submit their price proposal on Form F12

2. Technical

Section 1: Executive Summary and Introductory Materials
The introductory material shall include a title page with the RFP name, name of the Proposer, address, telephone number, the date, a Letter of Transmittal, and a Table of Contents. The executive summary shall be limited to a brief narrative (less than (4) four pages) summarizing the proposal.

Section 2: Qualification and Experience with Similar Projects:

Qualifications of the firm and key personnel responsible for support during the term of the contract. Proposer shall demonstrate the ability and resources to provide the outlined services and technical support to TRINITY METRO. Provide names and contact information of at least three owners/agencies for similar services performed.

Section 3: System Features and Functionality:

Features and functionality of the transit buses based on the requirements set forth in the Scope of Work

Sections 4: Project Approach and Management:

Manufacturing and installation timeline, the proposed plan for testing throughout various stages, and the training programs. Scoring will also reflect the strength of the project team, including leadership and project team resources allocation.

Section 5: Performance Standards and Warranty Terms:

Proposed performance standards and warranty terms. Scoring will take into consideration the ability to provide reliable buses.

Section 6 – Compliance/Exceptions and Proposed Modifications

Provide a table that contains all of the sections of this RFP and indicate compliance, noncompliance, exception description, and/or alternate.

3. Price Proposal/Payment Schedule/Financial Information

Payment Schedule

Proposers shall provide a payment schedule based on major milestones. Major milestones shall be the same as listed in the Project Management Plan. Do not list any payment schedules in the Project Management Plan. The proposed payment schedule will be subject to negotiation and final approval by Trinity Metro.

Financial Information

Proposers shall provide information demonstrating that it has the necessary financial resources to perform the Contract. This information shall include:

- Audited financial statements for the last (3) years, and year-to-date financial statements for the most recently completed operating quarter. The financial statements shall include Balance Sheets, Statements of Income and Stockholder's Equity, and a Statement of Change in Financial Position. If the Proposer is a parent or subsidiary of another entity, consolidated financial statements are also required.
- Unaudited balance sheets of Proposer and unaudited balance sheets of Proposer and its subsidiaries, if any, for interim quarterly periods since the close of its last fiscal year.
- Letter of Credit Commitments (if any).
- Names of banks or other financial institutions with which the Proposer conducts business.

The above information shall be handled as confidential data and utilized on a "need to know" basis for proposal evaluation

Section 7 Federal Contract and Other Requirements

7.1 No Obligation by the Federal Government.

a. The Purchaser and Contractor acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of the underlying contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to the Purchaser, Contractor, or any other party (whether or not a party to that contract) pertaining to any matter resulting from the underlying contract.

b. The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

7.2 Program Fraud and False or Fraudulent Statements or Related Acts.

1. The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § § 3801 et seq and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.
2. The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. §
5307, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the Contractor, to the extent the Federal Government deems appropriate.
3. The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

7.3 Access to Records.

1. Where the Purchaser is not a State but a local government and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C. F. R. 18.36(i), the Contractor agrees to provide the Purchaser, the FTA Administrator, the Comptroller General of the United States or any of their authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions.
2. Contractor also agrees, pursuant to 49 C. F. R. 633.17 to provide the FTA Administrator or his authorized representatives including any PMO Contractor access to Contractor's records and construction sites pertaining to a major capital project, defined at 49 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311.
3. Where the Purchaser is a State and is the FTA Recipient or a sub-grantee of the FTA Recipient in accordance with 49 C.F.R. 633.17, Contractor agrees to provide the Purchaser, the FTA Administrator or his authorized representatives, including any PMO Contractor, access to the Contractor's records and construction sites pertaining to a major capital project, defined at 49 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311. By definition, a major capital project excludes contracts of less than the simplified acquisition threshold currently set at $100,000.
4. Where the Purchaser enters into a negotiated contract for other than a small purchase or under the simplified acquisition threshold and is an institution of higher education, a hospital or other non-profit organization and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C.F.R. 19.48, Contractor agrees to provide the Purchaser, FTA Administrator, the Comptroller General of the United States or any of their duly authorized representatives with access to any books, documents, papers and record

of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions.

5. Where any Purchaser which is the FTA Recipient or a sub-grantee of the FTA Recipient in accordance with 49 U.S.C. 5325(a) enters into a contract for a capital project or improvement (defined at 49 U.S.C. 5302(a)1) through other than competitive bidding, the Contractor shall make available records related to the contract to the Purchaser, the Secretary of Transportation and the Comptroller General or any authorized officer or employee of any of them for the purposes of conducting an audit and inspection.

6. The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

7. The Contractor agrees to maintain all books, records, accounts and reports required under this contract for a period of not less than three years after the date of termination or expiration of this contract, except in the event of litigation or settlement of claims arising from the performance of this contract, in which case Contractor agrees to maintain same until the Purchaser, the FTA Administrator, the Comptroller General, or any of their duly authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related thereto. Reference 49 CFR 18.39(i)(11).

FTA does not require the inclusion of these requirements in subcontracts.

7.4 Federal Changes.

Federal Changes - Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between Purchaser and FTA, as they may be amended or promulgated from time to time during the term of this contract. Contractor's failure to so comply shall constitute a material breach of this contract.

7.5 Termination Provisions.

a. **Termination for Convenience** Fort Worth Transportation Authority, by written notice, may terminate this contract, in whole or in part, when it is in the Government's interest. If this contract is terminated, the Recipient shall be liable only for payment under the payment provisions of this contract for services rendered before the effective date of termination.

b. **Termination for Default** If the Contractor fails to deliver supplies or to perform the services within the time specified in this contract or any extension or if the Contractor fails to comply with any other provisions of this contract, Fort Worth Transportation Authority may terminate this contract for default. Fort Worth Transportation Authority shall terminate by delivering to the Contractor a Notice of Termination specifying the nature of the default. The Contractor will only be paid the contract price for supplies delivered and accepted, or services performed in accordance with the manner or performance set forth in this contract. If, after termination for failure to fulfill contract obligations, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of Fort Worth Transportation Authority.

c. **Opportunity to Cure** Fort Worth Transportation Authority in its sole discretion may, in the case of a termination for breach or default, allow the Contractor 30 – 60 days in which to cure the defect. In such case, the notice of termination will state the time period in which cure is permitted and other appropriate conditions

If Contractor fails to remedy to Fort Worth Transportation Authority's satisfaction the breach or default of any of the terms, covenants, or conditions of this Contract within ten (10) days after receipt by Contractor of written notice from Fort Worth Transportation Authority setting forth the nature of said breach or default, Fort Worth Transportation Authority shall have the right to terminate the Contract without any further obligation to Contractor. Any such termination for default shall not in any way operate to preclude Fort Worth Transportation Authority from also pursuing all available remedies against Contractor and its sureties for said breach or default.

d. **Waiver of Remedies for any Breach** In the event that Fort Worth Transportation Authority elects to waive its remedies for any breach by Contractor of any covenant, term or condition of this Contract, such waiver by Fort Worth Transportation Authority shall not limit Fort Worth Transportation Authority's remedies for any succeeding breach of that or of any other term, covenant, or condition of this Contract.

7.6 Civil Rights (EEO, Title VI & ADA).

1. *Nondiscrimination* - In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. §

2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. § 12132, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

2. *Equal Employment Opportunity* - The following equal employment opportunity requirements apply to the underlying contract:

1. *Race, Color, Creed, National Origin, Sex* - In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, and Federal transit laws at 49 U.S.C. § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, 'Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor,' 41 C.F.R. Parts 60 *et seq* ., (which implement Executive Order No. 11246, 'Equal Employment Opportunity,' as amended by Executive Order No. 11375, 'Amending Executive Order 11246 Relating to Equal Employment Opportunity,' 42 U.S.C. § 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national origin, sex, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

2. *Age* - In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § § 623 and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

3. *Disabilities* - In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, the Contractor agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, 'Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act,' 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

3. The Contractor also agrees to include these requirements in each subcontract financed in whole or in part with Federal assistance provided by FTA, modified only if necessary to identify the affected parties.

8. Buy America

Buy America - The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. Part 661, which provide that Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. 661.7, and include final assembly in the United States for 15 passenger vans and 15 passenger wagons produced by Chrysler Corporation, and microcomputer equipment and software. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. 661.11. Rolling stock must be assembled in the United States and have a 70 percent domestic content.

A Bidder or offeror must submit to the FTA recipient the appropriate Buy America certification (Attachment B) with all Bids or offers on FTA-funded contracts, except those subject to a general waiver. Bids or offers that are not accompanied by a completed Buy America certification must be rejected as nonresponsive. This requirement does not apply to lower tier subcontractors.

Contractor is required to submit documentation of the origin of steel and iron products used by submitting ways bills monthly with pay requests

7.8 Disadvantaged Business Enterprises (DBE's)

1. The Federal Fiscal Year goal has been set by Fort Worth Transportation Authority in an attempt to match projected procurements with available qualified disadvantaged businesses. Fort Worth Transportation Authority goals for budgeted service contracts, bus parts, and other material and supplies for Disadvantaged Business Enterprises have been established by Fort Worth Transportation Authority as set forth by the U.S. Department of Transportation Regulations 49 C.F.R. Part 23, March 31, 1980, and amended by Section 106(c) of the Surface Transportation Assistance Act of 1987, and are considered pertinent to any contract resulting from this Invitation for Bid. A specific DBE goal was assigned to the contract, and has been clearly stated in the proposal, and if the Contractor is found to have failed to exert sufficient, reasonable, and good faith efforts to involve DBE's in the work provided, Fort Worth Transportation Authority may declare the Contractor non-complaint and in breach of the contract.

a) Policy - It is the policy of the U.S. Department of Transportation and Fort Worth Transportation Authority that Disadvantaged Business Enterprises, as defined in 49 CFR Part 23, and as amended in Section 106(c) of the Surface Transportation and Uniform Relocation Assistance Act of 1987, will have the maximum opportunity to participate in the performance of Contract financed in whole or in part with federal funds under the agreement. Consequently, the DBE requirements of 49 CFR Part 23 and Section 106(c) of the STURAA of 1987, apply to the contract.

The Contractor agrees to ensure that DBEs as defined in 49 CFR Part 23 and Section 106(c) of the STURAA of 1987, have the maximum opportunity to participate in the whole or in part with federal funds provided under the agreement. In this regard, the Contractor will take all necessary and reasonable steps in accordance with the regulations to ensure that DBEs have the maximum opportunity to compete for and perform subcontracts. The Contractor will not discriminate on the basis of race, color, national origin, religion, sex, age or physical handicap in the award and performance of subcontracts. It is further the policy of Fort Worth Transportation Authority to promote the development and increase the participation of businesses owned and controlled by disadvantaged. DBE involvement in all phases of Fort Worth Transportation Authority procurement activities is encouraged.

b) DBE obligation _ The Contractor and its subcontractors agree to ensure that disadvantaged businesses have the maximum opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with federal funds provided under the Agreement. In that regard, all Contractors and subcontractors will take all necessary and reasonable steps in accordance with 49 CFR Part 23 as amended, to ensure that minority business enterprises have the maximum opportunity to compete for and perform contracts.

c) Where the Contractor is found to have failed to exert sufficient reasonable and good faith efforts to involve DBE's in the work provided, Fort Worth Transportation Authority may declare the Contractor noncompliant and in breach of contract.

d) The Contractor will keep records and documents for a reasonable time following performance of The Contract to indicate compliance with the Fort Worth Transportation Authority DBE program. These records and documents will be made available at reasonable times and places for inspection by any authorized representative of Fort Worth Transportation Authority and will be submitted to Fort Worth Transportation Authority upon request.

e) Fort Worth Transportation Authority will provide affirmative assistance as may be reasonable and necessary to assist the prime contractor in implementing their programs for DBE participation.

7.9 Incorporation of FTA Terms.
Incorporation of Federal Transit Administration (FTA) Terms - The preceding provisions include, in part, certain Standard Terms and Conditions required by DOT, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Agreement. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any (name of grantee)

requests which would cause Fort Worth Transportation Authority to be in violation of the FTA terms and conditions.

7.10 Energy Conservation.
Energy Conservation - The contractor agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

7.11 Suspension and Debarment
This contract is a covered transaction for purposes of 49 CFR Part 29. As such, the contractor is required to verify that none of the contractor, its principals, as defined at 49 CFR 29.995, or affiliates, as defined at 49 CFR 29.905, are excluded or disqualified as defined at 49 CFR 29.940 and 29.945.
The contractor is required to comply with 49 CFR 29, Subpart C and must include the requirement to comply with 49 CFR 29, Subpart C in any lower tier covered transaction it enters into.
By signing and submitting its bid or proposal, the bidder or proposer certifies as follows:
The certification in this clause is a material representation of fact relied upon by Fort Worth Transportation Authority. If it is later determined that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to Fort Worth Transportation Authority, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 49 CFR 29, Subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

7.12 Disputes
Fort Worth Transportation Authority and the contractor will attempt to resolve disputes or disagreements promptly. In order to do so, Fort Worth Transportation Authority and the contractor will create an issue resolution ladder which will outline initial responsibility for discussion and resolution, as well as secondary and further responsibility.

If a dispute or disagreement cannot be resolved through discussions between Fort Worth Transportation Authority's representative and the contractor's representative as designated on the issue resolution ladder, the contractor's senior representative and Fort Worth Transportation Authority's senior representative, upon the request of either party, shall meet as soon as conveniently possible, but in no case later than ten (10) days after such a request is made, to attempt to resolve such dispute or disagreement. Prior to any meetings between the senior representatives, Fort Worth Transportation Authority and the contractor shall exchange relevant information that will assist the parties in resolving their dispute or disagreement.

If after the meeting, the senior representatives determine that the dispute or disagreement cannot be resolved on terms satisfactory to both parties, the parties shall submit the dispute or disagreement to non-binding mediation. The mediation shall be conducted by a mutually agreeable impartial mediator, or if the parties cannot so agree, a mediator designated by the American Arbitration Association ("AAA") pursuant to its Construction Industry Mediation Rules, or if the dispute or disagreement is not for a construction contract, those mediation rules most applicable to the type of contract. The mediation will be governed by and conducted pursuant to a mediation agreement negotiated by the parties or, if the parties cannot so agree, by procedures established by the mediator. The venue for any required mediation shall be Tarrant County, Texas unless otherwise agreed to by the parties.

[Any claims, disputes, or controversies between the parties which have not been resolved in accordance with the procedures set forth in subsections 8-104 (1)-(3) of the Fort Worth Transportation Authority Procurement Policy shall be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association (AAA) then in effect, or if the dispute or disagreement is not for a construction contract, those mediation rules most applicable to the type of contract. If the matter or matters in dispute exceed $1,000,000, then arbitration proceedings shall be held before three members of an arbitration panel selected pursuant to AAA Rules. The venue for any required arbitration shall be Tarrant County, Texas unless otherwise agreed to by the parties.]

Notwithstanding the procedures identified in subsections 8-104 (1)-(4) of the Fort Worth Transportation Authority Procurement Policy, then Fort Worth Transportation Authority shall have the general ability and authority, when negotiating the terms and conditions of any contract to be entered into with any entity, to negotiate for the inclusion of dispute resolution procedures in such contract. Such dispute resolution procedures may vary from contract to contract, provided that, at a minimum, the procedures require that a meeting of senior representatives, mediation, and/or formal alternative dispute resolution procedures be followed before any party may file suit against, or initiate an arbitration proceeding against, Fort Worth Transportation Authority for an alleged breach of contract claim.

7.12.1 Performance During Dispute - Unless otherwise directed by Fort Worth Transportation Authority, Contractor shall continue performance under this Contract while matters in dispute are being resolved.

7.13 Claims for Damages
Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the party or of any of his employees, agents or others for whose acts he is legally liable, a claim for damages therefor shall be made in writing to such other party within a reasonable time after the first observance of such injury of damage.

7.14 Remedies
Unless this contract provides otherwise, all claims, counterclaims, disputes and other matters in question between Fort Worth Transportation Authority and the Contractor arising out of or relating to this agreement or its breach will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the State of Texas.

7.15 Rights and Remedies
The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by Fort Worth Transportation Authority, Architect or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

7.16 Rights and Remedies A. Definitions for Purposes of the section

The term “days” refers to working days of the Authority.

The term “interested party” means any person (a) who is an actual Proposer or prospective Proposer in the procurement involved, and (b) whose direct economic interest would be affected by the award of the contract or by a failure to award the contract.

Note – The Federal Transit Administration (FTA) will be notified by the Authority of all formal, written protests, when FTA funds are involved.

B. Fort Worth Transportation Authority will hear and consider a bona fide protest regarding its procurement actions. It is anticipated that the majority of protests will be evaluated and finally decided by the Authority. Accordingly, the Authority intends to provide a thorough review of all bona fide bid protests. The Authority’s primary concern, however, is the timely procurement of needed capital equipment, supplies or services. It does not intend to allow the filing of protests to unnecessarily delay the procurement process, especially if the protest involved is vexatious or frivolous in nature.

Notwithstanding the availability of these protest procedures, any interested party is encouraged to exhaust all methods described in this section of resolving an issue before filing a formal protest with the Authority. In

its consideration of a protest, the Authority reserves the right to give due consideration to the good faith efforts of the protestor to resolve the issue involved through informal methods.

C. Submission of Protest

Any interested party may file a protest with the Authority on the basis that the Authority has failed to comply with applicable Federal or State Regulations or with the Authority's Procurement Process. The protest shall be filed in accordance with the timing requirements set forth in subsection D. "Types of Protests and Timing" of this section, and shall include: The name, phone number, e-mail and address of the protestor.

The RFQ and proposed contract number of the proposal. A statement of grounds for the protest, a statement as to what relief is requested, and in particular the Federal or State law or Authority Process alleged to have been violated. This statement shall be accompanied by any supporting documentation the protesting party desires the Authority to consider in making its decision.

Protest shall be submitted to:
Sherry Lee
Sr. Director of Procurement
Trinity Metro
801 Grove Street
Fort Worth, TX 76102

D. Types of Protests and Timing
The requirement for timely filing of protest with the Authority will depend upon the type of protests involved. The Authority will consider the following three types of protest by interested parties:
1. Protest regarding proposal
Any protest regarding the proposal shall be filed no later than five (5) business days before proposal due date. Any protest filed after that date regarding the proposal will not be considered by the Authority. This type of protest would include any claim that the proposal contained exclusionary or discriminatory specification, any challenge to the basis of award, or any claim that the proposal documents or the proposal process violated applicable Federal or State law, or that the Authority failed to follow its Procurement Process in the proposal.

2. Protests regarding Requirements and Responsiveness
Any protest regarding the requirements and responsiveness of proposal by the Authority shall be filed with Authority no later than five (5) business days after receipt of letter of notification of non-responsiveness. Any protest filed after such date regarding the requirements and responsiveness will not be considered by the Authority.

This type of protest would include any challenge to determinations by the Authority of the responsiveness of or the responsibility of a Proposer, or any claim that the requirements and responsiveness of proposal violated Federal or State law or the Authority's Procurement Process.

3. Protest Regarding Receipt of Non-Award Notification

Any protest regarding the award of the contract shall be filed no later than five (5) business days after receipt of Non- Award Notification. Any protest regarding the award of the contract filed after that date will not be considered by the Authority.

This type of protest will only be entertained by the Authority if the protestor is able to demonstrate that the party awarded the contract fraudulently represented itself as a responsible Proposer of that the Authority violated Federal or State regulations or its Procurement Process in the award of the contract.

E. Authority Response
The Authority will notify the protestor upon timely receipt of a protest and may, where appropriate, request additional information from the protestor. The Authority may, at its discretion, meet with protestor to review

the matters raised by the protest. The Authority's consideration of the particular types of protests will, except as otherwise stated in subsection 2. "Decisions by Authority" of this section E. "Authority Response" in accordance with the following provisions:

1. Types of Protests

a. Protest regarding proposal
Upon receipt of a timely filed protest regarding the proposal, the Authority will postpone the opening until resolution of the protest. No additional proposals will be accepted during the period of postponement.

If the protest regarding the proposal involves a claim of unduly restrictive or exclusionary specifications, the Authority will, in evaluation of the protest, consider both the specific need of the Authority for the feature or item challenged and any effects on competition of including the specifications regarding that feature or item. If the Authority determines that such feature or item was included in the specification in order to meet justified and valid transit needs of the Authority, and was not unduly restrictive of competition or designed to exclude a particular competitor, then the Authority will have grounds to deny the protest.

b. Protest regarding requirement and responsiveness

Upon receipt of a timely filed protest regarding the requirements responsiveness, the Authority will suspend its evaluation of all proposals submitted until resolution of the protest, if the Authority determines that the protestor has established that there are reasonable doubts regarding the responsiveness of a proposal or the responsibility of a Proposer or regarding the Authority's compliance with Federal or State Regulations or its Procurement Process.

c. Protests after non-award notification
Upon receipt of a timely filed protest regarding the non-award notification the Authority will not proceed with contract, if necessary, until the resolution of the protest if the Authority determines that the protestor has established a prima facie case that the contract was awarded fraudulently or in violation of that Federal or State Regulations or the Authority's Procurement Process.

2. Decisions by Authority
As indicated above, in most instances the Authority will suspend the procurement process upon receipt of a bona fide protest. However, the Authority reserves the right, notwithstanding the pendency of a protest, to proceed with the appropriate action in the procurement process or under the contract in the following cases:

A. Where the item to be procured is urgently required;
B. Where the Authority determines that the protest was vexatious or frivolous; and
C. Where delivery or performance will be unduly delayed or other undue harm will occur, by failure to make the award promptly.

After reviewing the protest submitted under this section, the Authority will issue a written decision of the basis of the information provided by the protestor, the results of any meetings with protestor, and the Authority's own investigation. If the protest is upheld, the Authority will take appropriate action to correct the procurement process and protect the rights of the protestor, including re-proposal, revised evaluation of proposal or Authority determinations, or termination of the contract. If the protest is denied, the Authority will lift any suspension imposed and proceed with the procurement process.

F. FTA Protest Procedure

Reviews of protests by FTA will be limited to claims that the Authority failed to have or follow protest procedures, or claims the Authority failed to review a complaint or protest. A protestor shall exhaust all administrative remedies with the Authority before pursuing a protest with FTA. An appeal to FTA shall be received by the cognizant FTA regional or Headquarters Office within five (5) working days of the date the protester knew or should have known of the violation.

Under certain circumstances, protest may be made to the FTA in accordance with FTA circular 4220.1F.

Violations of Federal law or regulation will be handled by the complaint process stated within that law or regulation. Violations of State or local law or regulations will be under the jurisdiction of State or local authorities.

7.17 Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, as amended by the Lobbying Disclosure Act of 1995, P.L. 104-65 [to be codified at 2 U.S.C. § 1601, et seq.] –
Contractors who apply or bid for an award of $100,000 or more shall file the certification required (F12) by 49 CFR part 20, "New Restrictions on Lobbying." Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-Federal funds with respect to that Federal contract, grant or award covered by 31 U.S.C. 1352. Such disclosures are forwarded from tier to tier up to Fort Worth Transportation Authority.

7.18 Clean Air
(1) The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 *et seq*. The Contractor agrees to report each violation to Fort Worth Transportation Authority and understands and agrees that Fort Worth Transportation Authority will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.
(2) The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

7.19 Clean Water
(1) The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq . The Contractor agrees to report each violation to Fort Worth Transportation Authority and understands and agrees that Fort Worth Transportation Authority will, in turn, report each violation as required to assure notification to FTA and the appropriate EPA Regional Office.
(2) The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

7.20 Recycled Products
Not required for this RFP

7.21 Americans with Disabilities Act of 1990 (ADA)

The Contractor agrees to comply with the requirements of 49 U.S.C. § 5301(d) which expresses the federal policy that the elderly and persons with disabilities have the same right as other persons to use mass transportation service and facilities, and that special efforts shall be made in planning and designing those services and facilities to implement those policies. The Management Company also agrees to comply with all applicable requirements of section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, which prohibits discrimination on the basis of handicaps, and with the Americans with Disabilities Act of 1990 (ADA), as amended, 42 U.S.C. §§ 12101 *et seq*., which requires the provision of accessible facilities and services, and with the following federal regulations, including any amendments thereto:

- U.S. DOT regulations, "Transportation Services for Individuals with Disabilities (ADA)," 49 C.F.R. Part 37;
- U.S. DOT regulations, "Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance," 49 C.F.R. Part 27;
- Joint U.S. Architectural and Transportation Barriers Compliance Board/U.S. DOT regulations, "Americans With Disabilities (ADA) Accessibility Specifications for Transportation Vehicles," 36 C.F.R. Part 1192 and 49 C.F.R. Part 38;
- U.S. DOJ regulations, "Nondiscrimination on the Basis of Disability in State and Local Government Services," 28 C.F.R. Part 35;
- U.S. DOJ regulations, "Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities," 28 C.F.R. Part 36;
- U.S. GSA regulations, "Accommodations for the Physically Handicapped,"41 C.F.R. Subpart 101-19;
- U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630;
- U.S. Federal Communications Commission regulations, "Telecommunications Relay Services and Related Customer Premises Equipment for the Hearing and Speech Disabled," 47 C.F.R. Part 64, Subpart F; and
- FTA regulations, "Transportation for Elderly and Handicapped Persons," 49 C.F.R. Part 609.

7.22 Davis- Bacon and Copeland Anti-Kickback Acts

49 U.S.C. § 5333(a)

40 U.S.C. §§ 3141 – 3148

29 C.F.R. part 5

18 U.S.C. § 874

29 C.F.R. part 3

Applicable to: Construction contracts over $2000.

Background and Application

The Davis-Bacon and Copeland Acts are codified at 40 USC 3141, et seq. and 18 USC 874. The Acts apply to grantee construction contracts and subcontracts that "at least partly are financed by a loan or grant from the Federal Government." 40 USC 3145(a), 29 CFR 5.2(h), 49 CFR 18.36(i)(5). The Acts apply to any construction contract over $2,000. 40 USC 3142(a), 29 CFR 5.5(a). 'Construction,' for purposes of the Acts, includes "actual construction, alteration and/or repair, including painting and decorating." 29 CFR 5.5(a). The requirements of both Acts are incorporated into a single clause (see 29 CFR 3.11) enumerated at 29 CFR 5.5(a) and reproduced below. The clause language is drawn directly from 29 CFR 5.5(a) and any deviation from the model clause below should be coordinated with counsel to ensure the Acts' requirements are satisfied.

(1) Minimum wages - (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) Except with respect to helpers as defined as 29 CFR 5.2(n)(4), the work to be performed by the classification requested is not performed by a classification in the wage determination; and (2) The classification is utilized in the area by the construction industry; and (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and (4) With respect to helpers as defined in 29 CFR 5.2(n)(4), such a classification prevails in the area in which the work is performed.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if

known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer

the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(v)(A) The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if

known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination with 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to

paragraphs (a)(1)(v) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(2) Withholding - FWTA shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the

accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, FWTA may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records - (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid.

Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to FWTA for transmission to the Federal Transit Administration as requested. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5 and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Federal Transit Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees - (i) Apprentices - Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination.

Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division of the U.S. Department of Labor determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees - Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually

performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity - The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements - The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts - The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Transit Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment - A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements - All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards - Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract.

Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility - (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1). (ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C.1001.

7.23 Contract Works Hours and Safety Standards Act.

The contractor agrees to comply with applicable provisions of Section 103 and 107 of the Contract Work Hours and Safety Standards Act (40 USC 327-330) as supplemented by Department of Labor regulations 29 CFR, Part 5.5. Compliance with the provisions of this article by all levels of subcontractors will be the responsibility of the contractor.

(1) Overtime requirements - No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she· is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages - In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for comp damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of $ 10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

(3) Withholding for unpaid wages and liquidated damages - The FWTA shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

(4) Subcontracts - The contractor or subcontractor shall insert in any subcontracts the clauses set forth in this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in this section.

(5) Payrolls and basic records - (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section l(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.S(a)(l)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

7.24 Electronic and Information Technology

Fort Worth Transportation Authority agrees that reports or information it provides to or on behalf of the Federal Government will use electronic or information technology that complies with the accessibility requirements of:

a. Section 508 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794d, and

(1) U.S. ATBCB regulations, "Electronic and Information Technology Accessibility Standards," 36 C.F.R. part 1194.

7.25 Prohibition on certain telecommunications and video surveillance services or equipment.

In accordance with 2 CFR 200.216, Trinity Metro is prohibited from purchasing certain telecommunications and video surveillance services or equipment. As such, Contractor agrees not to purchase any telecommunications and/or video surveillance services or equipment produced by the companies listed below or any subsidiary or affiliate of such entities for this contract. Fort Worth Transportation Authority is prohibited from obligating or expending loan or grant funds to:

(1) Procure or obtain;

(2) Extend or renew a contract to procure or obtain; or

(3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

(i) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

(ii) Telecommunications or video surveillance services provided by such entities or using such equipment.

(iii) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

(b) In implementing the prohibition under Public Law 115-232, section 889, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.

7.26 Safe Operation of Motor Vehicles

a. Distracted Driving, Including Text Messaging While Driving.

(1) Contractor and their subcontractors are encouraged to adopt and enforce workplace safety policies to decrease crashes caused by distracted drivers, including policies to ban text messaging while using an electronic device supplied by contractor, and driving a vehicle the driver owns or rents, a vehicle Contractor owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the contract, or when performing any work for or on behalf of the contract;

(2) Contractor agrees to conduct workplace safety initiatives in a manner commensurate with its size, such as establishing new rules and programs to prohibit text messaging while driving, re-evaluating the existing programs to prohibit text messaging while driving, and providing education, awareness, and other outreach to employees about the safety risks associated with texting while driving. Contractors are encouraged to include this provision in each subconsultant agreement.

b. Seat Belt Use.

Contractors and their subcontractors are encouraged to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company-owned, rented, or personally owned vehicles.

7.27 Domestic Preference.

As appropriate and to the extent consistent with law, the Service Provider should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). Consistent with §200.322, the following items shall be defined as: "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber

Section 8 Detailed Submittal Requirements

Proposers shall assemble their proposals in strict adherence to the layout requirements identified in this section. Failure to follow all proposal layout requirements may result in disqualification. Proposals shall be prepared as simply as possible and provide a straightforward, concise description of the proposed products and services to satisfy the requirements of the RFP. Attention shall be given to accuracy, completeness, relevance, and clarity of content. Proposals shall address the following questions and contain the following three parts.

PART 1 – Forms – 11 Forms (F1 through F12) in Section 10

PART 2 – Technical – 6 Sections

PART 3 – Financial – Payment Schedule, and Financial (If you mail in your proposal, please ensure that you seal your financial information in a separate envelope.)

1.-Forms

Ensure that all forms are completed, signed, and dated by authorized signature.

Price Proposal

Proposers shall submit their price according to the format provided.

2. - Technical

Section 1: Executive Summary and Introductory Materials

The introductory material shall include a title page with the RFP name, name of the Proposer, address, telephone number, the date, a Letter of Transmittal, and a Table of Contents. The executive summary shall be limited to a brief narrative (less than (4) four pages) summarizing the proposal.

Section 2: Qualification and Experience with Similar Projects:

Qualifications of the firm and key personnel responsible for implementation of the farebox system and ongoing support during the term of the contract. Proposer shall demonstrate the ability and resources to provide the outlined services and technical support to FWTA. Provide names and contact information of at least three owners/agencies for similar services performed.

Section 3: System Features and Functionality:

Features and functionality of the transit buses based on the requirements set forth in the Scope of Work

Sections 4: Project Approach and Management:

Manufacturing and installation timeline, the proposed plan for testing throughout various stages, and the training programs. Scoring will also reflect the strength of the project team, including leadership and project team resources allocation.

Section 5: Performance Standards and Warranty Terms:

Proposed performance standards and warranty terms. Scoring will take into consideration the ability to provide reliable buses.

Section 6 – Compliance/Exceptions and Proposed Modifications

Provide a table that contains all of the sections of this RFP and indicate compliance, noncompliance, exception description, and/or alternate.

Part 3 Payment Schedule/Financial Information

TO BE SUBMITTED SEPERATELY.

Payment Schedule

Proposers shall provide a payment schedule based on major milestones. Major milestones shall be the same as listed in the Project Management Plan. Do not list any payment schedules in the Project Management Plan. The proposed payment schedule will be subject to negotiation and final approval by FWTA.

Financial Information

Proposers shall provide information demonstrating that it has the necessary financial resources to perform the Contract. This information shall include:

F. Audited financial statements for the last (3) years, and year-to-date financial statements for the most recently completed operating quarter. The financial statements shall include Balance Sheets, Statements of Income and Stockholder's Equity, and a Statement of Change in Financial Position. If the Proposer is a parent or subsidiary of another entity, consolidated financial statements are also required.

G. Unaudited balance sheets of Proposer and unaudited balance sheets of Proposer and its subsidiaries, if any, for interim quarterly periods since the close of its last fiscal year.

H. Letter of Credit Commitments (if any).

I. Names of banks or other financial institutions with which the Proposer conducts business.

The above information shall be handled as confidential data and utilized on a "need to know" basis for proposal evaluation.

Section 9 Safety, Security and Emergency Requirements

Site visitors, to include contracted individuals providing services to Trinity Metro are required to comply with the following safety, security, and/or emergency guidelines:

1. All providers will meet federal, state, and local regulatory guidelines related to safe practices and/or are related to safety in order to avoid hazards, potential hazards, and/or damage to Trinity Metro property.
2. Contractors and Vendors are responsible for their equipment and personnel.
3. In the event of an emergency, site visitors shall follow emergency response best practices; each provider should have an emergency plan. As needed, Trinity Metro designee(s) may need to review an emergency plan for acceptance. This will depend on the area work is being conducted. Designated rallying points may be provided by Trinity Metro representatives, so please ask and include in any Job and/or Safety Briefings to be prepared in the event of an emergency evacuation.
4. Contractor and vendor providers are required to notify a Trinity Metro representative, a.k.a. point of contact, after any emergency events. This may be the Procurement Department representative or designated project lead. Alternatively, Trinity Metro's Operations Radio Control Center, or Security Center shall be notified as is deemed necessary, when reporting security or safety-related events requiring Trinity Metro response. Site visitors conducting work on Trinity Metro property should know whom to notify prior to commencement of work on Trinity Metro property.
5. Vendors, Contractors, and Sub-Contractors working within any Bus Lot, Train Station, and/or Transit Center are required to provide scope of work being performed to the appropriate Trinity Metro designee so details for coordinating with revenue service vehicles (trains, buses, cutaways, and vans) paths and schedules will not disrupt any transit service.
6. Trespassing and/or unauthorized site work is prohibited. This is especially more significant whenever the need arises to be within 25 feet of any railroad track rail unless on public right away such as platforms or grade crossings. Roadway Worker Protection requirements per federal law (49 CFR Part 214) may require successful completion of training and authorized access. Disruptions to commuter passenger railroad operations is unacceptable and may be subject to federal fines.
7. Depending on the nature of the work being performed, Trinity Metro may require submission of a safety plan, security plan, and/or emergency plan subject to review and acceptance by the Chief Safety Officer or Director of Security or other designee.
8. In the event of an accident or incident resulting in harm to an individual or damage to Trinity Metro property, a safety stand down may be required. Accordingly, when deemed necessary, corrective action and preventive measures(s) subject to approval or acceptance by the Chief Safety Officer or Director of Security or other designee

may be required prior to resuming work on behalf of Trinity Metro or on Trinity Metro property.

9. Larger scale projects and procurement of equipment may deem it necessary to comply with Safety and Security Certification Program requirements.
10. Questions regarding safety, security, and/or emergency requirements may be directed to Trinity Metro's Procurement designee or lead Project Manager.

Section 10 Attachments and Forms

THE FOLLOWING FORMS AND CERTIFICATIONS SHALL BE COMPLETED BY PROPOSER AND SUBMITTED WITH PROPOSAL, AS SPECIFIED IN SECTION 1 MINIMUM REQUIREMENTS.

F1 - Attachments and Amendments
F2 - DBE Compliant Statement
F3 - Certification of Contractor Regarding Debarment, Suspension, and Other Responsibility Matters
F4 - Conflict of Interest Acknowledgement and Certification
F5 - Certification of Compliance with Restriction on Lobbying
F6 - Build America/Buy America Certification
F7 - Business Questionnaire & List of References
F8 - List of References for Similar Projects
F9 - Affidavit of Non-Collusion
F10 - Prohibition of Contracts with Companies Boycotting Israel
F11 – Trinity Metro Safety, Security and Emergency Requirements
F12 – Base Price Proposal

NOTE: FAILURE TO COMPLETE AND RETURN THE FORMS AS INDICATED ABOVE WILL RESULT IN REJECTION OF THE BID/PROPOSAL.

The making of a material misrepresentation of fact could be a basis for disqualification and may cause a firm to be considered for classification as an irresponsible contractor and barred from Trinity Metro work for a period not exceeding six months.

F1- ATTACHMENTS AND AMENDMENTS

The undersigned acknowledges receipt of attachments and amendments for The Fort Worth Transportation's solicitation **RFP 23-T007-Electric Transit Buses.**

ATTACHMENTS:

AMENDMENTS:
Failure to acknowledge receipt of all attachments and amendments may cause bidder/proposer to be considered nonresponsive to the solicitation.

Acknowledged receipt of each attachment and amendment must be clearly established and included with the bid/proposal response.

Authorized Signature	***Name of Company***
Printed Name and Title	***Date***

F2 - DBE COMPLIANCE STATEMENT

I hereby certify that the Proposer has complied with the requirements of 49 CFR 26, Participation by Disadvantaged Business Enterprises in DOT Programs, and that its goals have not been disapproved by the Federal Transit Administration.

Name and title of the proposer's authorized official:

_____ _____

Authorized signature Date

F3- CERTIFICATION OF CONTRACTOR REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

The potential contractor for Trinity Metro contract (hereinafter "PRIMARY PARTICIPANT"), certifies to the best of its knowledge and belief, that it and its principals:

Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

Have not within a three year period preceding this bid been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (2) of this certification; and

Have not within a three-year period preceding this application/bid had one or more public transactions (Federal, State, or local) terminated for cause or default.

(If the primary participant is unable to certify to any of the statements in this certification, the participant shall attach an explanation to this certification)

THE PRIMARY PARTICIPANT CERTIFIES OR AFFIRMS TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS ON 31 U.S.C. SECTIONS 3801 ET SEQ. ARE APPLICABLE THERETO.

Signature:		Date:	
Name / Title:			
Company Name:			

Primary participant <u>is required to secure from every subcontractor</u> this same certification and <u>shall submit such to Trinity Metro</u> prior to such subcontractor's commencing work under this contract. Contractor may make as many copies of this schedule as needed for certification by all subcontractors.

F3- CERTIFICATION OF CONTRACTOR REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS CONTINUED

(If the subcontractor is unable to certify to any of the statements above in this certification, the subcontractor shall attach an explanation to this certification)

THE UNDERSIGNED SUBCONTRACTORS FOR TRINITY METRO, CERTIFY OR AFFIRM AS TO ITSELF AND ITS PRINCIPALS TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SET OUT ABOVE AND SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTAND THAT THE PROVISIONS OF 31 U.S.C. SECTIONS 3801 ET SEQ. ARE APPLICABLE TO THIS CERTIFICATION.

Signature:		Date:	
Name/ Title:			
Company Name:			

Signature:		Date:	
Name / Title:			
Company Name:			

F4 - CONFLICT OF INTEREST ACKNOWLEDGMENT AND CERTIFICATION

1. Policy

In order to promote fairness and impartiality in Trinity Metro's procurement process, involvement in any decision making role in the solicitation, or in the awarding or administration of a resulting contract by any Related Person who might receive some Benefit is prohibited. "Related Person" is defined as any employee, officer, Executive Committee member, or agent of Trinity Metro. "Benefit" is defined as any direct or indirect pecuniary, financial, or other tangible advantage, gain, promotion, or interest growing out of or related in any manner to the solicitation or to a contract or subcontract growing out of the solicitation. Such involvement of any Related Person is also prohibited when a person bearing certain relationship to the Related Person ("Other Related Person") may receive a Benefit. Such "Other Related Person" is defined as any member of a Related Person's immediate family (a spouse, child, parent, brother or sister), a partner of any Related Person, or any person or organization which employs or is about to employ a Related Person or Other Related Person. If a Related Person or Other Related Person will or may so benefit, a prohibited conflict of interest may exist.

2. Disclosures

Your obligation, as a prospective contractor under this solicitation, is to disclose fully all information you have or may acquire which has to do with any such Benefit which may come to any Related Person or Other Related Person. In considering the possibility of the existence of such benefit, you also need to consider each person and firm you believe may be involved as a joint venturer, or subcontractor, or other similar role in carrying out and performing a contract with Trinity Metro pursuant to the solicitation. In other words, if you are aware of any business, financial, or other interest, or actual or potential employment relationship between any Related Person or any Other Related Person, on the one hand, and yourself or any other person or firm you believe may be involved in carrying out the contract to be awarded pursuant to this solicitation, on the other hand, you have an affirmative obligation to fully disclose that information to Trinity Metro. You are encouraged to contact the Director of Contract Administration and Procurement or Trinity Metro's General Council prior to the deadline for submitting your Response (defined as a bid, proposal or other response to this solicitation), make such disclosure, and request a ruling as to whether any prohibited conflict of interest does in fact exist.

In order for your Response to be considered RESPONSIVE to this solicitation, it is mandatory that you complete and execute the Acknowledgment and Certification below, and include with your Response, written disclosure of all information relative to any potential conflict of interest which may be known to you, and which you have not disclosed to Trinity Metro in writing prior to the submission of your Response.

Signature:		Date:	
Name/ Title:			
Company Name:			

F4 ACKNOWLEDGMENT AND CERTIFICATION CONTINUED
(Potential Contractor)

The undersigned potential contractor of Trinity Metro hereby acknowledges receipt and understanding of the Conflict of Interest provisions set out above; and hereby certifies that, except as heretofore or herewith fully disclosed in writing, to the best of potential contractor's knowledge and belief, no such conflict exists, or is likely to exist in the future pertaining to this procurement should the contract be awarded to potential contractor; and potential contractor further hereby promises to promptly notify Trinity Metro in writing if such knowledge or belief changes in the future.

By:

Signature:		Date:	
Name / Title:			

ACKNOWLEDGMENT AND CERTIFICATION
(Recommended Subcontractor)

The undersigned recommended subcontractor of Trinity Metro hereby acknowledges receipt and understanding of the Conflict of Interest provisions set out above; and hereby certifies that, except as heretofore or herewith fully disclosed in writing, to the best of recommended subcontractor's knowledge and belief, no such conflict exists, or is likely to exist in the future pertaining to this procurement should the contract be awarded to recommended subcontractor; and recommended subcontractor further hereby promises to promptly notify Trinity Metro in writing if such knowledge or belief changes in the future.

By:

Signature:		Date:	
Name / Title:			

Note: Proposer shall make copies of the Conflict of Interest document and Acknowledgment and Certification form and provide same to each subcontractor Proposer recommends for the contract. Proposer is required to secure an acknowledgment and certification from each subcontractor Proposer recommends and submit such certification to Trinity Metro prior to a subcontractor beginning any work under this contract.

F5 - CERTIFICATION OF COMPLIANCE WITH RESTRICTIONS ON LOBBYING

I, _____ (Name of certifying official), the _____ (Title or position of certifying official) of _____ (name of company), do hereby certify on behalf of said company to Trinity Metro that:

1. It will not use federal funds to support lobbying.

2. No federal funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

3. If any funds other than Federal funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

4. *All subcontractors and sub-recipients shall certify and disclose accordingly.* This certification is a material representation of fact upon which reliance is placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S.C. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

By:

Signature:		Date:	
Name / Title:			

Note: Proposer shall make copies of this blank page and obtain certification from all subcontractors that Proposer is recommending, and submit such certifications to Trinity Metro prior to such subcontractors beginning any work under this contract.

F6 – BUILD AMERICA/BUY AMERICA CERTIFICATION

Section 165 (a) of the Surface Transportation Act of 1982 permits FTA participation in this contract only if iron, steel and/or manufactured products used in the contract are produced in the United States. If the contract is for the procurement of buses, vans or other "rolling stock" as defined in 49 C.F.R. Part 661, the cost of components produced in the United States shall exceed 70% of the cost of all components, and final assembly shall take place in the United States. Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. No. 117-58, which includes the Build America, Buy America Act ("the Act"). Pub. L. No. 117-58, §§ 70901-52 permits FTA participation in this contract if all of the iron, steel, manufactured products, and construction materials used in the project are produced in the United States.

Complete one of TRINITY METRO two certifications below if this contract is for the procurement of such rolling stock, or if steel and manufactured products are otherwise used in this contract:

The Proposer hereby certifies that it will comply with the requirements of Section 165 (a), Pub. L. No. 117-58, §§ 70901-52 (or the requirements of Section 165 (b)3 if this contract is for the procurement of "rolling stock") of the Surface Transportation Assistance Act of 1982 and the regulations in 49 C.F.R. 661.

Signature:		Date:	
Name / Title:			
Company Name:			

OR

The Proposer hereby certifies that it cannot comply with the requirements of Section 165(a), Pub. L. No. 117-58, §§ 70901-52 (or with the requirements of Section 165(b)3 if this contract is for the procurement of "rolling stock") of the Surface Transportation Act of 1982, but it may qualify for an exception to the requirement pursuant to Section 165(b) of the Surface Transportation Assistance Act and regulations in 49 C.F.R. 661.7. (Fully explain and document facts on which Proposer relies for its belief that it qualifies for exception).

Signature:		Date:	
Name / Title:			
Company Name:			

F7 - BUSINESS QUESTIONNAIRE

This questionnaire, the requested list of references and the authorization to release financial information are used in part to assist in determining a potential contractor's responsibility. Proposer's shall submit the information with the offer. All information shall be current and traceable. Each venture of a joint venture shall submit a separate signed form.

Trinity Metro reserves the right to make additional inquiries based on information submitted, or the lack thereof. Questions concerning this questionnaire or the authorization form shall be directed to the contact person identified on the solicitation.

Legal Name of Proposer ("Business"):
List name(s) and business address of officers and directors for corporations, partners for partnerships, and ventures for joint ventures (attach additional pages as necessary):
Number of years in business under present business name:
If applicable, list all other names under which the business identified above operated in the last 5 years:
Annual Gross Revenue (past year): M=millions K=thousands
_____$100K - $500K _____$500K - $1M _____$1M-$10M _____$10M-$20M _____>$20M
Has the business, or any officer or partner, failed to complete a contract? ____Yes ____No
Is any litigation pending against the business? _____Yes _____No
Has the business ever been declared "not responsible" for the purpose of any governmental agency contract award? _____Yes _____No
Has the business been debarred, suspended, proposed for debarment, declared ineligible, voluntarily excluded, or otherwise disqualified from bidding, proposing or contracting? _____Yes _____ No
Are there any proceedings pending relating to the business' responsibility, debarment, suspension, voluntary exclusion or qualification to receive a public contract? ___Yes ___No
Has the government or other public entity requested or required enforcement of any of its rights under a surety agreement on the basis of a default or in lieu of declaring the business in default? _____Yes _____No
(1) Is the business in arrears on any contract or debt? _____Yes _____No

(2) Has the business been a defaulter, as a principal, surety or otherwise? ___Yes ___No

(3) Have liquidated damages or penalty provisions been assessed against the business for failure to complete work on time or for any other reason? _____Yes _____No

(4) Does the business maintain a drug-free workplace? _____Yes _____No

(5) If a "yes" response is given under questions 6-14, provide a detailed explanation including dates, reference to contract information, contacts, etc. (attach additional pages as necessary):

(6) Business Identification Number (EIN, etc.)

(7) Provided completed List of References for Similar Projects form. _____Yes ____No

I, individually and on behalf of the business named in this Business Questionnaire, do by my signature below, certify that the information provided in this questionnaire is true and correct. I understand that any false statements or misrepresentations regarding the business named above may result in:

1. Termination of any or all contracts which Trinity Metro has or may have with the business,
2. Disqualification of the business from consideration for contracts,
3. Removal of the business from Trinity Metro's proposers' list and/or
4. Legal action(s) applicable under federal, state or local law.

Signature:		Date:	
Name / Title:			
Company Name:			

F8 - LIST OF REFERENCES FOR SIMILAR PROJECTS

(Use additional pages as necessary)

F9 - AFFIDAVIT OF NON-COLLUSION

Each member of the proposing team **(prime and subs)** shall submit a signed and notarized Form 12 – Non-Collusive Affidavit.

THE UNDERSIGNED, HAVING SUBMITTED BID TO PROVIDE Electric Transit Buses in response to RFP 23-T007 swear that said proposer or quoter has not directly or indirectly entered into any combination, collusion, undertaking, or agreement relative to price to be bid by any person, or to prevent any person, or persons, or company from submitting pricing; or to entice any proposer or quoter to refrain from pricing for such supplies, merchandise, service, or contract, and that said bid so made is without reference or regard to any other bid or bids, and without agreement, understanding or combination, either directly or indirectly, with any person or persons, with reference to such bidding in any way or manner whatsoever.

Signature:		Date:	
Name / Title:			
Company Name:			

STATE of _____

County of _____

This instrument was subscribed and sworn before me this ____day of, _____, 20___.

(Personalized Seal Below)

_____
Notary Public Signature

_____
My Commission Expires (Date)

Failure to properly Notarize and Return This Form with the Bid Will Invalidate Your Bid.

F10 - PROHIBITION OF CONTRACTS WITH COMPANIES BOYCOTTING ISRAEL

(This form must be completed and submitted with the bid/proposal)

House Bill 89, effective September 1, 2017, amended the Texas Government Code to add Chapter 2270, Prohibition of Contracts with Companies Boycotting Israel.

Effective September 1, 2017, a state agency and a political subdivision (which includes a transportation authority) may not enter a contract with a company for goods or services unless the contract contains a written verification from the company that; (i) it does not Boycott Israel; and (ii) will not Boycott Israel during the term of the contract.

"Boycott Israel" is defined to mean refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

"Company" is defined to mean a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of those entities or business associations that exists to make a profit.

I, _____ (Name of certifying official), the _____ (Title or position of certifying official) of _____ (name of company), do hereby verify on behalf of said company to Trinity Metro that said company does not Boycott Israel and will not Boycott Israel (as that term is defined in Texas Government Code Section 808.001) during the term of this contract.

Signature:		Date:	
Name / Title:			

F11 – TRINITY METRO SAFETY, SECURITY AND EMERGENCY REQUIREMENTS

The undersigned acknowledges and agrees to Trinity Metro's Safety, Security and Emergency Requirements as outlined in Section 9 of this RFP

Authorized Signature	***Name of Company***
Printed Name and Title	***Date***

F12 – BASE PRICE PROPOSAL

FORT WORTH TRANSPORTATION AUTHORITY (Trinity Metro)
This does not represent an order for the purchase by Trinity Metro
Use this form in submitting all Proposed Costs for the size(s) of Bus and Equipment Proposed by Your Firm

RFP 23 – T010
ELECTRIC TRANSIT BUSES

QTY	DESCRIPTION	BUS SIZE PROPOSED	UNIT PRICE	EXTENDED PRICE
6 EA	Electric Transit Buses (2023-2024)	35’	$	$
10-Days Minimal 40 Hours	Training/Manuals			
10 EA	OPTION: Electric Transit Buses (2023-2027)	30’	$	$
25 EA	OPTION: Electric Transit Buses (2023-2027)	35’	$	$
15 EA	OPTION: Electric Transit Buses (2023-2027)	40’	$	$
1	Turn-Key Charging System:		$	$
	Charging System Equipment:		$	$
	Charging System Labor/Profit/Overhead:			

i. List all other or additional costs.
ii. Provide estimated cost information for training expenses.
iii. How many manuals will be provided with training, and in what format will they be provided?
iv. Include any escalation costs for optional buses.

Proposer Name: _____

Title of Signing Official:

Signature:

Date:

Mailing Address:

Email Address:

PRICE TO BE QUOTED FOB FORT WORTH

Proposal Prices will be valid for a period of 180 days.

Trinity Metro reserves the right to reject any and all Proposals for any reason deemed to be to the benefit of Trinity Metro. Trinity Metro reserves the right to accept or reject all or any part of a Proposal, to waive minor technicalities and to award the resulting Contract to best serve the interest of Trinity Metro.

Payment Terms: _____

Delivery Lead-time for Initial Order of 6 Buses: _____

Warranty Period for Buses: